

INSTRUCTION BOOK



75A-3

AMATEUR

RECEIVER





75A-3

AMATEUR-BAND RECEIVER

INSTRUCTION BOOK

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA

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INFORMATION NEEDED:

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- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
- (H) Item or symbol number of same obtained from parts list or schematic
- (I) Collins' number (and name) of unit sub-assemblies involved in trouble
- (J) Remarks

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INFORMATION NEEDED:

- (A) Quantity required
- (B) Collins' part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins' type number, name, and serial number of principal equipment
- (E) Unit sub-assembly number (where applicable)



Figure 1-1. 75A-3 Amateur-Band Receiver

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SECTION I DESCRIPTION

1. GENERAL.

The 75A-3 is a dual-conversion communications receiver covering all amateur bands in the range 160-10 meters. It is the only amateur-band receiver featuring the Collins Mechanical Filter. The 75A-3 also features excellent stability, sensitivity, and dial accuracy.

The Collins Mechanical Filter, a new and radically different means of achieving selectivity in communications receivers, uses mechanically resonant elements to produce a selectivity curve having a flat "nose" for full sideband response and steep, almost vertical skirts for rejection of adjacent-channel interference.

Because the mechanical filter in the 75A-3 has a nearly rectangular selectivity curve, the receiver is well suited for single-sideband suppressed-carrier reception. And with the 75A-3 it is possible to use single-sideband techniques on AM signals by tuning one sideband and the carrier to the exclusion of the other sideband. Because of the unusual tuning characteristics of the 75A-3, the owner should familiarize himself with the operational procedures described in Section III of this manual.

The mechanical filter supplied with the 75A-3 has a 3-kc bandpass for optimum performance in AM and single-sideband reception; however, an 800-cycle filter, an accessory unit, may be installed for use under conditions of heavy QRM and QRN. Both filters are plug-in units and mount side by side in the receiver. A two-position switch on the front panel of the receiver is used to select the desired filter.

The direct-reading tuning dial is calibrated in 1-kc divisions on 160, 80, 40, 20 and 15 meters and 2-kc divisions on 11 and 10 meters. A crystal-controlled front end and temperature-compensated, hermetically-sealed variable frequency oscillator contribute to the frequency stability of the 75A-3. Physical shock will not change the VFO frequency unless the shock is so severe that the dial setting is changed.

Included in the 75A-3 are a 4-position crystal filter, a 'phone noise limiter which automatically adjusts the clipping level according to the strength of the incoming signal, a separate noise limiter for CW reception, delayed and amplified AVC, and provisions for external standby control and receiver muting. Two plug-in units available for use in the 75A-3 are the 148C-1 NBFM adaptor and the 8R-1 crystal calibrator.

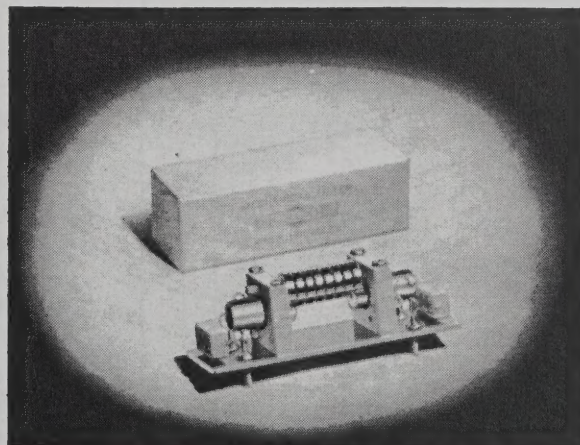


Figure 1-2. Collins Mechanical Filter

Section I
Description

2. REFERENCE DATA.

a. RF CIRCUITS.

(1) SELECTIVITY.

- (a) With 3-kc filter approx. 3 kc at 6 db down and 6.5 kc at 60 db down (see typical curve, Figure 1-3).
- (b) With crystal filter position 4: approx. 40 cps at 6 db down and 4 kc at 60 db down.

- (2) SENSITIVITY** 2 uv for signal-to-noise ratio of 6 db.

(3) STABILITY.

- (a) Mechanical CW beat note will not change if receiver is jarred unless dial setting is changed.
- (b) Electrical stable within a few cycles under normal operating conditions and after short warm-up period.

- (4) IMAGE REJECTION** at least 50 db.

- (5) AVC** constant audio output within 6 db for r-f input change of 5 uv to 0.5 v.

b. TUNING FEATURES.

- (1) COVERAGE** 1.5 - 2.5 mc; 3.2 - 4.2 mc; 6.8 - 7.8 mc;
14.0 - 15.0 mc; 20.8 - 21.8 mc; 26.0 - 28.0 mc;
28.0 - 30.0 mc.

- (2) BANDSPREAD** linear; ten turns of vernier dial covers each range.

- (3) DIAL ACCURACY** within 1 kc on 160-15 meters and 2 kc on 11 and 10 meters.

- (4) "S" METER** S9 corresponds to signal of about 100 uv.

c. TUBE COMPLEMENT.

<u>SYMBOL</u>	<u>TUBE TYPE</u>	<u>FUNCTION</u>
V-1	6CB6	r-f amplifier
V-2	6BA7	first mixer
V-3	6BA7	second mixer
V-4	12AT7	crystal oscillator
V-5	6BA6	455 kc i-f amplifier
V-6	6BA6	455 kc i-f amplifier
V-7	6BA6	455 kc i-f amplifier
V-8	6AL5	detector and AVC rectifier
V-9	12AX7	AVC amplifier and a-f amplifier
V-10	6AL5	automatic noise limiter
V-11	6AQ5	audio power amplifier
V-12	6BA6	beat frequency oscillator
V-13	5Y3GT	power rectifier
V-14	6BA6	variable frequency oscillator
V-15	6BA6	VFO isolation
V-16	6AL5	CW noise limiter
V-17	OA2	voltage regulator
V-18	6BA6	455 kc i-f amplifier

- d. POWER SOURCE 115 v, 50-60 cps; power consumption approx. 85 w.
- e. ANTENNA INPUT accommodates wide range of antenna impedances;
designed for 50-150 ohms terminal impedance;
mounting holes provided for coax connectors.
- f. AUDIO OUTPUT approx. 2.5 w.
- g. CABINET DIMENSIONS 21-1/8 in. wide; 12-1/2 in. high; 13-1/16 in. deep;
chassis fits standard relay rack; chassis depth
13-5/16 in.
- h. FINISH dark grey wrinkle.
- i. ACCESSORIES.
- (1) 800-CYCLE MECHANICAL FILTER mechanical filter with bandpass of approx. 800 cycles;
plugs in socket on receiver chassis.
- (2) SPEAKER external 10-in. speaker in matching cabinet; Speaker
cabinet 15 in. wide, 11-1/8 in. high, 9-1/8 in. deep.
- (3) HEADPHONES low or high impedance; any type is suitable.
- (4) ANTENNA see e.
- (5) CRYSTAL CALIBRATOR 8R-1 plugs into a socket on receiver chassis; provides
100-kc reference signals for calibration.
- (6) NBFM ADAPTOR 148C-1 plugs into socket on receiver; contains limiter and
discriminator.

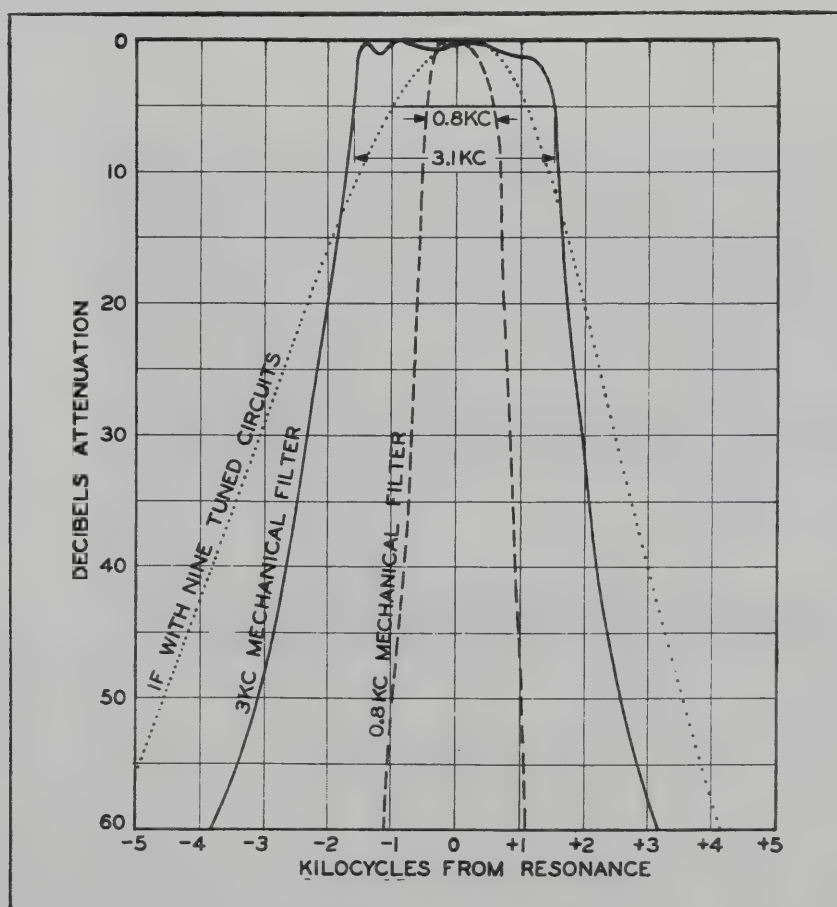


Figure 1-3. 75A-3
Selectivity Curves

SECTION II INSTALLATION

1. UNPACKING.

Open packing cartons carefully to prevent damage to the equipment. Remove packing material and remove the equipment from the cartons. Search the packing material for small packages. Inspect the receiver for loose screws and bolts. Check all knobs, switches, etc., to see that they operate properly. Any claims for damage should be filed promptly with the transportation company. If a claim is to be filed, the original packing case must be preserved. See instructions on back of the bill of lading.

2. EXTERNAL CONNECTIONS (see figure 2-1).

a. ANTENNA AND GROUND. The antenna con-

ductor strip is located at the rear of the chassis on the right-hand side. Balanced antennas should be connected to terminals 1 and 2. When a balanced antenna is used, grounding terminal G may introduce noise. Therefore, to determine the more satisfactory arrangement, try the receiver both with and without an external ground. A single-wire antenna should be connected to terminal 1 with terminals 2 and G connected together and grounded.

b. COAXIAL CONVERSION.

To convert the receiver for coaxial-line antenna input, remove the receiver from the cabinet, unsolder the wires from the rear of the antenna terminal strip, and remove the strip. Remove the plate adjacent to the antenna terminal strip and bolt it in place of

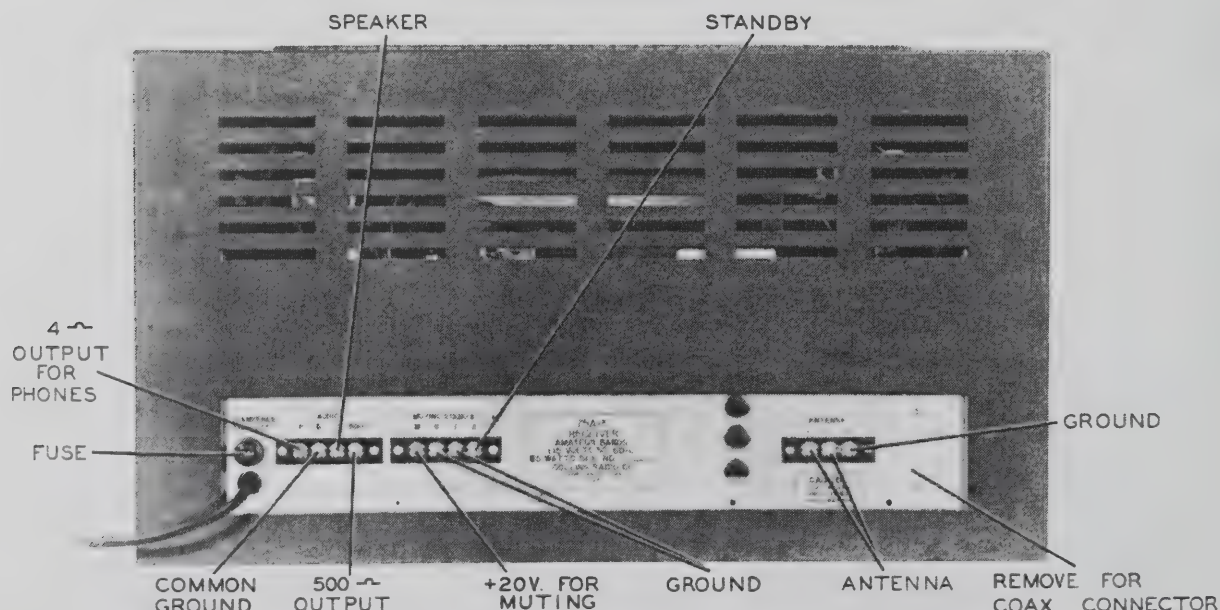


Figure 2-1. 75A-3 Receiver, Rear View

the terminal strip. The holes exposed when the plate is removed are the correct size for Collins 357 9005 00 (Army type SO 239, Amphenol 83-1R) socket (not furnished). The mating plug is a Collins 357 9014 00 (Army PL-259, Amphenol 83-1SP) (not furnished). Receptacle UG-58/U (mating plug UG-21B/U) may also be used for coaxial conversion. Figure 5-9 shows the proper method for assembling plug UG-21B/U to RG-8/U cable. Connect the wire taken from terminal 1 to the center pin of the coaxial socket and the wire taken from terminal 2 to the shell of the socket. The external ground can be connected to the G terminal on the audio or muting terminal strips.

CAUTION

Do not subject the antenna input to RF exceeding 50 volts. Excessive RF voltages may be encountered if the receiving antenna is not disconnected when the transmitter is operating. Capacity coupling across contacts of the antenna changeover relay may also result in excessive RF voltage when the transmitter is operating. A relay should be used to ground antenna terminals 1 and 2 directly to the receiver chassis when the transmitter is operating. These connections should be made with short leads. This precaution is necessary if the transmitter signal will light a small neon bulb at the receiver antenna terminals.

c. OUTPUT CONNECTIONS.

(1) **SPEAKER.** The output connections are on the rear of the chassis at the left-hand side. Terminals G and 4 are for connection to a speaker voice coil. This output is interlocked with the headphone jack on the front panel so that plugging in headphones disables the speaker.

(2) **HEADPHONES.** In addition to the front-panel jack, a pair of terminals marked G and P is provided for rear-chassis headphone connection. This output is connected to the 4-ohm tap on the output transformer and is not interlocked with the front-panel jack.

d. **500-OHM OUTPUT.** These terminals may be used to feed a transmitter or telephone line for 'phone patch, or may be connected to a sidetone oscillator or monitor.

e. **STANDBY.** The standby terminals, marked 1 and 2, are located at the rear of the chassis on

the center terminal strip. These terminals are across a blocking bias resistor and are in parallel with contacts on the OFF-STANDBY-ON switch. The terminals may be connected to contacts of a send-receive relay for external standby control. With the OFF-STANDBY-ON switch in STANDBY position, closing the standby circuit will allow the receiver to operate. Opening the standby circuit will disable the audio output tube.

f. **MUTING.** Terminals M and G on the center terminal strip at the rear of the chassis are provided for connection to a source of muting voltage for break-in CW operation. This source must be capable of delivering +20 volts to the terminals for key-down muting and 0 volts key up. The Collins 32V-1, 32V-2, 32V-3, and KW-1 transmitters provide a muting voltage.

The muting voltage may be obtained from the cathode resistor of a keyed stage which is biased to cutoff during key-down conditions, from a resistor in series with a cathode-keyed stage, or from a battery in series with auxiliary contacts on a keying relay. Terminal G must be connected to a point of ground potential and terminal M to the source of positive voltage.

NOTE

Neither the disabling nor the muting circuits provide protection to the antenna input circuit. See part 2 of this section, paragraph b.

g. **POWER.** The receiver must be powered from a 115-volt, 50/60 cps source.

h. **FUSE.** The fuse is in an extractor-type fuse post located on the rear of the chassis near the left-hand corner. To remove the fuse, push in the fuse-post cap, turn it counterclockwise, and pull straight out. Use only a 2-ampere fuse.

3. "S" METER ADJUSTMENT.

Set up the receiver for AM operation (Section III, part 2), short the antenna input connections, and set the zero-adjust control, located on top of the receiver chassis, for an "S" meter reading of 0.

4. 148C-1 NBFM ADAPTOR UNIT INSTALLATION.

This unit plugs into the socket behind the VFO. To install the unit, first remove the receiver from the cabinet. Remove the snap button from

Section II

Installation

the top of the receiver chassis. The hole provides access to the tuning core adjustment at the bottom of the discriminator transformer. Remove the two nuts from the spade bolts protruding from the bottom of the NBFM unit; plug the unit into the adaptor socket. Replace the nuts on the spade bolts underneath the chassis. While the receiver is out of the cabinet, realign the NBFM unit (refer to Section V, part 9).

5. 8R-1 CALIBRATOR UNIT INSTALLATION.

This unit plugs into the socket located at the rear left-hand corner of the receiver chassis; no special mounting procedure is necessary. To align the unit, set up for CW reception (Section III, part 4, paragraph a.), and turn off the BFO. Allow the receiver to warm up for about 20 minutes and tune in WWV at 2.5, 15, or 30 mc. Turn the OUT-LIMITER-CAL. switch to CAL. Adjust C-301 in the calibrator unit for zero beat. For frequency measuring procedures, refer to Section III, part 7, FREQUENCY MEASURING.

6. INSTALLATION OF OUTPUT CIRCUIT TO A PANADAPTOR.

Materials needed for Modification:

- 2' RG-58/U Cable
- 1 Terminal; Insulated standoff, tapped, 3/4" x 1/4"
- 1 Capacitor; 2 uuf, 500 WV, tubular ceramic
- 1 Solder lug; double-end locking
- 1 Solder lug; tear drop, 5/16" hole
- 1 Cable plug; UG-245/U
- 1 Receptacle; UG-206/U

- 1 Screw; (for mounting standoff.)
- 3 Solder lugs; 21/32" long for #6 screw

Procedure:

1. Remove bottom shield-cover of receiver.
2. Mount standoff and lug on left-side panel in the front shield compartment below V4 socket and T3.
3. Connect the 2 uuf ceramic capacitor from the standoff to terminal "A" of T3.
4. Strip one end of coax cable. Connect shield to lug and center lead to standoff.
5. Dress the cable toward center along front of chassis and below bandswitch shaft, then through grommet. Continue along other side of shield to rear of chassis. Fasten 3 places with long lugs at screws available. Bend lugs over cable.
6. Drill 5/16" hole adjacent to upper right corner of nameplate for mounting connector. Be sure it will not interfere with wiring and shielding.
7. Mount the connector, using large lug under nut for ground. Strip cable and connect shield to lug and center lead to coax fitting.
8. T3 may need to be adjusted slightly. Refer to Section V, part 4, through 4b. (7).

SECTION III OPERATION

1. CONTROLS.

a. **OFF-STANDBY-ON.** This switch turns the receiver power on and off and in **STANDBY** position allows filament and plate voltages to remain on but disables the audio output tube.

In **STANDBY** position, R-76 (1500 ohms) is inserted in series with the bias load resistors to increase the bias voltage on the output tube and cut off the plate current. Standby terminals 1 and 2 on the rear of the chassis are connected across R-76 to allow the use of an external send-receive switch or relay to control the standby function.

b. **BAND CHANGE.** Each position of this switch corresponds to one amateur band. Turning the control knob turns the shaft of the bandswitch and at the same time rotates the dial drum so that the scale in use is visible through the **MEGACYCLE** window.

c. **MEGACYCLES - KILOCYCLES.** The main tuning dials are a slide-rule **MEGACYCLE** dial and circular **KILOCYCLE** dial. The **MEGACYCLE** dial is calibrated in 100-kc divisions on each scale. The 160, 80, 40, 20, and 15-meter bands are on 1-mc scales, and the 11 and 10-meter bands are on 2-mc scales. The **KILOCYCLE** dial is calibrated in 1-kc divisions on 160-15 meters and in 2-kc divisions on 11 and 10 meters. The **KILOCYCLE** dial has three scales; the lower scale is green, and is calibrated in 2-kc divisions for the 11 and 10-meter bands; the center scale is black, and is calibrated in 1-kc divisions for 80 - 15 meters; and the upper scale, also marked in 1-kc divisions, is red, and is used on 160 meters. The 160-meter scale is separate from the black scale because kilocycle readings on this band run in the opposite direction from those on the other bands.

Scales on the **MEGACYCLE** dial are colored to correspond to the colors on the **KILOCYCLE** dial.

The frequency at which the receiver is set is determined by combining the readings of the two dials. For example, if the **MEGACYCLE** scale reads 3.8 plus and the **KILOCYCLE** scale reads 52, the receiver is tuned to 3852 kc; or if the **MEGACYCLE** dial reads 28.6 plus and the **KILOCYCLE** dial reads 32, the receiver is tuned to 28,632 kc. However, since unusual tuning techniques are involved in operating the 75A-3, the dial reading may not exactly correspond to the frequency of the received signal. For frequency measuring procedures, refer to part 7 of this section, **FREQUENCY MEASURING**.

d. **CW-AM-FM.** In **CW** position, this switch turns on the BFO, disables AVC, and switches the **CW** noise limiter into the circuit. In **AM** position, the BFO is turned off, the AVC is turned on, and the 'phone limiter is used instead of the **CW** limiter. In **FM** position, detector and limiter functions are switched to the **NBFM** adaptor socket.

e. **A-B.** This switch is operated to select one of the mechanical filters. Only the 3-kc filter is supplied with the 75A-3; the 800-cycle filter is available as an accessory.

f. **RF GAIN.** This control is used to adjust the gain of the r-f stage and the fixed i-f stages. In **AM** reception, this control is usually set at maximum (fully clockwise) and the **AUDIO GAIN** control used for volume control. AVC is not fully effective unless the **RF GAIN** control is set at maximum. For **CW** or single-sideband reception, the **AUDIO GAIN** control is usually set at maximum and the **RF GAIN** control used for volume control. For exact tuning and operating procedures, refer to parts 2 - 6 of this section.

Section III Operation

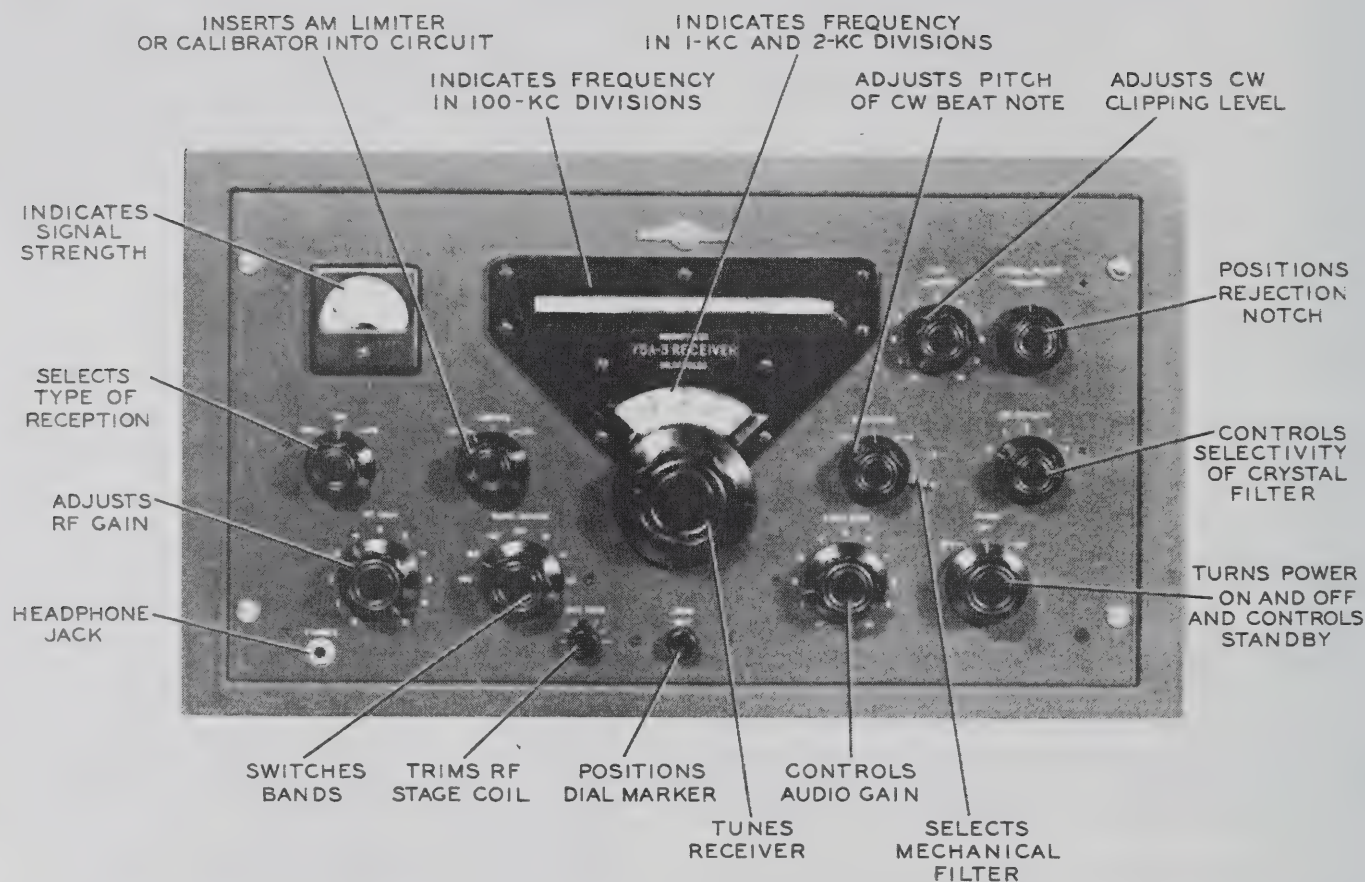


Figure 3-1. 75A-3 Front Panel Controls

g. **AUDIO GAIN.** This control is used to adjust the gain of the first audio stage.

h. **BFO PITCH.** This control is adjusted to change the pitch of the beat note when the BFO is used on CW reception and is used to position the reinserted carrier for single-sideband reception. If the receiver is properly aligned, the BFO frequency should be 455 kc when the knob is at center position. Rotating the knob clockwise from this position should move the BFO frequency higher than 455 kc; and rotating the knob counterclockwise from center position should move the BFO frequency lower than 455 kc. The +1 position corresponds to a BFO frequency of approximately 456 kc; and -1, 454 kc. For single-sideband and CW tuning techniques, refer to parts 3 and 4 of this section, respectively.

i. **ANT. TRIM.** This control should be adjusted for maximum r-f gain each time a different band is used. The control shaft is coupled to a trimmer capacitor across the r-f coil for the band in use and

is used to compensate for changes in antenna characteristics from one band to another.

j. **OUT-LIMITER-CAL.** In OUT position, this switch disables the 'phone noise limiter. In LIMITER position, the 'phone noise limiter is in the circuit; and in CAL position, B+ is applied to the plate-circuit pin of the crystal calibrator socket.

k. **CW LIMITER.** When the CW-AM-FM switch is in the CW position, the CW LIMITER control is used to adjust the level at which clipping occurs. Maximum clipping occurs at the fully clockwise position of this control.

l. **SELECTIVITY.** This switch controls the degree of selectivity afforded by the crystal filter, except in position 0, where the crystal filter is not in the circuit. Tuning is progressively sharper as the switch is operated from position 0 to position 4. This control is used primarily in CW reception, but may be used in AM reception when interference

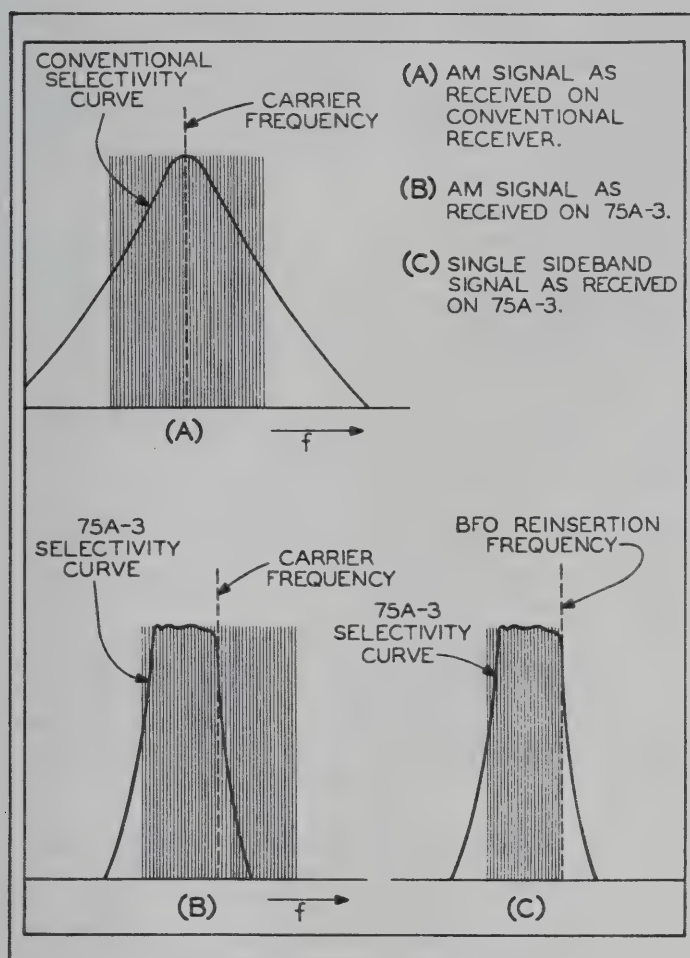


Figure 3-2. Tuning (A) a Conventional Receiver; (B) and (C) the 75A-3, using the 3-kc Mechanical Filter

is severe. For CW tuning procedures, refer to part 4 of this section.

m. **CRYSTAL FILTER PHASING.** When the crystal filter is in position 1, 2, 3, or 4, the phasing control may be used to "notch out" interfering heterodynes. For CW reception when no heterodynes are present, the phasing control will yield maximum noise rejection in center position.

n. **ZERO SET.** Rotating the ZERO SET knob moves the indicator line on the KILOCYCLE dial. This adjustment allows exact calibration of the kilocycle dial on a signal of known frequency. Calibration procedures are described in part 7 of this section, **FREQUENCY MEASURING.**

2. TUNING AM SIGNALS.

The 75A-3 does not tune like a conventional

communications receiver. Because the 3-kc mechanical filter in the i-f system has a bandpass with a flat top and straight, almost vertical sides, with the 75A-3 it is possible to tune one sideband of an AM station and reject the other. As shown in figure 3-2A, with a conventional receiver an AM station must be tuned "on the nose", for if the selectivity curve is imposed on a sideband, the carrier will appear so far down the curve that the signal will sound distorted, as if by overmodulation. But the 75A-3 selectivity curve can be placed to receive the carrier and all of one sideband, as shown in figure 3-2B. Thus, if an adjacent station is interfering with one sideband of the station being copied, it is possible to tune to the other sideband without losing any of the carrier. In fact, if a carrier is tuned to the center of the 75A-3 curve, the modulation loses its high-frequency components. This is because the receiver is tuned to receive only half of the sideband frequencies, those within 1500 cycles of the carrier. But by placing the carrier inside the selectivity curve near the edge, the full 3-kc of sideband frequencies is passed. This tuning technique requires only a few minutes' practice:

- a. Set up for AM reception: Power ON; operate BAND CHANGE to desired band; CW-AM-FM switch to AM; OUT-LIMITER-CAL. to OUT; SELECTIVITY to 0; RF GAIN maximum - use AUDIO GAIN for volume control.

- b. Tune in AM station.

- c. Adjust ANT. TRIM for maximum "S" meter reading.

- d. Tune toward one side of the station being received until the "S" meter reading drops sharply. Then carefully tune into the signal again until the "S" meter reading increases to its former value and the modulation is readable. The receiver is now tuned to one sideband and the carrier of the AM station. If heterodyne interference on this sideband is strong, tune off to the "other side" of the signal and listen to the other sideband.

- e. If noise is severe, turn the OUT-LIMITER-CAL. switch to LIMITER.

- f. If heterodyne interference is bad on both sidebands, tune the better sideband and turn the SELECTIVITY control to 1. Operate the CRYSTAL FILTER PHASING control over its entire range (90° either side of center position) to find the position at which the heterodyne is weakest. If more selectivity is necessary, turn

Section III Operation

the **SELECTIVITY** control to position 2, 3, or 4, as necessary. Readjust the phasing control each time the **SELECTIVITY** switch is operated.

NOTE

The operating procedure described above also applies if an 800-cycle mechanical filter is used. The 800-cycle filter should be used in AM reception only under conditions of heavy adjacent-channel interference or intense atmospheric noise.

3. TUNING SINGLE-SIDEBAND SIGNALS.

The 75A-3 is used for single-sideband reception in much the same manner as is any other good communications receiver. However, for best results it is necessary to reinsert the carrier near the edge of the selectivity curve, as shown in figure 3-2C.

An operator not accustomed to receiving single sideband may at first experience considerable difficulty in tuning S.S.S.C. (single-sideband suppressed-carrier) signals, because for maximum intelligibility it is necessary to reinsert a carrier not more than a few cycles from the suppressed-carrier frequency.

The tuning procedure outlined in paragraphs a. through i. following should be of some help to the operator who is unfamiliar with single-sideband techniques.

a. **Calibrating the BFO:** It is first necessary to establish settings of the **BFO** control knob corresponding to carriers at either edge of the selectivity curve (see figure 3-2C; here the **BFO** reinsertion frequency for a lower sideband is 455 kc plus 1500 cycles, or 456.5 kc). These points lie approximately 3/16 inch to the left of the -1 mark and 3/16 inch to the right of the +1 mark, respectively. The calibration procedure described in steps (1) through (7) following need not be performed unless a means of suppressed-carrier frequency determination is necessary (see part 7 of this section, paragraph c.)

(1) Set up for CW reception but do not turn on the **BFO** or crystal filter. (Power ON; operate **BAND CHANGE** to desired band; **CW-AM-FM** switch to **AM**; **AUDIO GAIN** maximum - use **RF GAIN** for volume control.)

(2) Find an **AM** station which is "in the clear", tune exactly to the center of the signal, and turn on the **BFO**. If the receiver is properly aligned,

zero beat should occur at or near center position of the **BFO** knob.

(3) Turn the main tuning dial 1.5 kc lower than the center of the **AM** signal. The beat note will now be 1500 cycles.

(4) Zero beat the station again, using the **BFO** knob. Zero beat should occur at some point to the right of the +1 mark. With a pencil or crayon, mark this position - it is the **BFO** setting to be used when tuning lower sidebands.

(5) Return the main tuning dial setting to the **AM** carrier frequency and zero beat again at or near center position of the **BFO** knob.

(6) Turn the main tuning dial 1.5 kc higher than the center of the **AM** signal. The beat note will now be 1500 cycles.

(7) Zero beat the station by means of the **BFO** knob. Zero beat should occur at some point to the left of the -1 mark. With a pencil or crayon, mark this position - it is the **BFO** setting to be used when tuning upper sidebands.

The **BFO** need be calibrated only once. The calibration points are not critical; in fact, for cases of severe interference from **AM** stations, the carrier may have to be inserted at some point far inside or outside the selectivity curve.

b. Set up for single-sideband reception: **Power ON**; operate **BAND CHANGE** to desired band; **CW-AM-FM** switch to **CW**; **SELECTIVITY** to 0; **CW** limiter to 0; **AUDIO GAIN** maximum - use **RF GAIN** for volume control.

c. Adjust **ANT. TRIM** for maximum background noise.

d. Tune to **S.S.S.C.** station.

NOTE

As of January, 1953, most **S.S.S.C.** stations on 75 meters are using the lower sideband and most stations on 20 meters are using the upper sideband.

e. If the **S.S.S.C.** station is using the upper sideband, turn the **BFO PITCH** control to the left-hand, or -1500 mark as determined in step a. If the station is using the lower sideband, turn the control to the right-hand, or +1500 mark.

f. Very carefully adjust the main tuning dial

until the "monkey chatter" becomes readable. This may take considerable patience the first few times, since S.S.S.C. tuning is very critical. Fine adjustment of the BFO PITCH control will help in relocating the carrier.

g. If noise is severe advance the CW LIMITER control as needed.

h. If heterodyne interference is severe, turn the SELECTIVITY control to position 1, 2, 3, or 4 as necessary, and adjust the crystal filter phasing control to "notch out" the interfering signal, as described in part 2, paragraph f., of this section.

i. If the crystal filter does not help in eliminating the heterodyne, carefully turn the main tuning dial through the S.S.S.C. signal and away from the interfering carrier. Then readjust the BFO pitch control until the S.S.S.C. station is readable. This measure will also eliminate some of the S.S.S.C. sideband, and should be used only in cases of severe interference.

NOTE

The operating procedures described above also apply if an 800-cycle mechanical filter is used, except that the BFO must be offset 400 cycles instead of 1500 cycles.

If an S.S.S.C. transmitter is used in conjunction with the 75A-3, it may be possible to use the transmitter carrier frequency (before carrier suppression) for carrier reinsertion in receiving. Or, if the S.S.S.C. signal is derived from a 455-kc filter system, the 455-kc oscillator used in this system may be used to supply a reinserted carrier. In either of these cases, the BFO in the receiver need not be used.

4. TUNING CW SIGNALS.

The 75A-3 is capable of single-signal CW reception under conditions of heavy QRM and QRN. The 75A-3 crystal filter used in conjunction with the mechanical filter makes possible extremely sharp tuning. However, tuning CW signals on a good communications receiver requires special tuning techniques for best results. This is especially true of the 75A-3 when the crystal filter is used with an 800-cycle mechanical filter. Failure to follow the procedure outlined below will result in unsatisfactory CW reception.

a. Set up for CW reception: Power ON; operate BAND CHANGE to desired band; CW-AM-FM switch to CW; SELECTIVITY to 0; CW LIMITER to 0; AUDIO GAIN maximum - use RF GAIN for volume control.

b. Adjust BFO PITCH to +1 or -1.

c. Adjust ANT. TRIM for maximum background noise.

d. Tune in a CW station. If the BFO PITCH control is set at +1, tune the CW station from the high-frequency side. If the BFO PITCH control is set at -1, tune the CW station from the low-frequency side. Carefully adjust the main tuning knob until the CW station is loudest.

e. Adjust the BFO PITCH control to the desired pitch.

f. Whether or not bad interference is present in most cases the crystal filter improves CW reception by eliminating annoying background noise. Turn the SELECTIVITY control to 1 and the CRYSTAL FILTER PHASING control to center position. Again very carefully adjust the main tuning knob for the loudest note. In most cases, the first position of the crystal filter provides satisfactory CW reception. If the CW station drifts, do not compensate for this drift by readjusting the BFO PITCH control. Instead carefully retune the receiver by means of the main tuning dial. When the station is tuned for the loudest note, the BFO PITCH control may be adjusted for the desired beat note.

g. In tuning across a band, the SELECTIVITY control should be in position 0 or 1. Greater degrees of selectivity make it difficult to locate weak stations. If the BFO PITCH control is set clockwise from center position, tune CW stations on the high-frequency side of zero-beat; and if the control is set counterclockwise from center position, tune CW signals on the low-frequency side of zero-beat.

h. To eliminate bad adjacent-signal interference advance the SELECTIVITY control to step 1, 2, 3, or 4, as necessary, carefully retune the signal, and adjust the CRYSTAL FILTER PHASING control to minimize interference. In some cases it is possible to eliminate adjacent-signal interference by rotating the BFO PITCH control through zero beat and listening with the control set at the other side of center position. If adjacent signals are not extremely strong, leave the CRYSTAL FILTER

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PHASING control in center position for minimum background hiss. The 75A-3 selectivity curve is extremely sharp with the crystal filter in the circuit. Unless the CW station is extremely stable, it may occasionally be necessary to readjust the main tuning control to peak the signal.

NOTE

CW selectivity can be increased even further if an 800-cycle mechanical filter is used with the crystal filter. Tuning procedures are the same.

5. EXALTED CARRIER TECHNIQUE.

In exalted-carrier reception, an AM signal is tuned "off to the side" just far enough that the AM carrier lies outside the selectivity curve and the AM sideband falls inside the curve; the BFO is used, as in single sideband reception, to supply the carrier. This method of tuning AM signals is difficult with an ordinary receiver because the carrier usually cannot be placed far enough down the selectivity curve that it does not beat with the BFO to produce annoying flutter. But because the mechanical filter selectivity curve has extremely steep skirts, the 75A-3 can easily be tuned to accept an AM sideband and reject the carrier.

This tuning system can be used in cases where selective fading causes fluctuations in an AM carrier and consequent distortion of the audio. A separate carrier, supplied by the BFO, will not fluctuate in amplitude. Hence, a sideband can be beat against the BFO and will be readable even when the AM carrier is not present.

The exalted-carrier method may also be used to eliminate low-frequency heterodynes caused by QRM only a few hundred cycles from the AM carrier. In this case, the receiver can be tuned to reject the first few hundred cycles of an AM sideband; and a carrier is supplied by means of the BFO. Tuning procedures for exalted-carrier reception are outlined below:

a. Set up for exalted-carrier reception: Power ON; operate BAND CHANGE to desired band; CW-AM-FM switch to AM; OUT-LIMITER-CAL switch to OUT; SELECTIVITY to 0; CW LIMITER to 0; AUDIO GAIN maximum - use RF GAIN for volume control.

b. Adjust ANT. TRIM for maximum background noise.

c. Tune in AM station.

d. If selective fade is bad: Tune off to one side of the AM signal until the carrier disappears and only the sideband is audible. Turn on the BFO and adjust the BFO PITCH control until the signal is readable. For upper-sideband reception, the BFO must be set counterclockwise from center position; clockwise for the lower sideband.

e. If low-frequency heterodyne is bad: Tune off to the side of the AM signal in the direction which causes the heterodyne to disappear. Only the sideband will be audible. Set the BFO according to the directions in d., above, to make the sideband readable.

f. If noise is bad, use the CW noise limiter. If QRM is still bad, use the crystal filter according to the instructions given in part 2, paragraph f. of this section.

6. TUNING NBFM SIGNALS.

A 148C-1 adaptor unit must be plugged in its socket for NBFM reception, and the CW-AM-FM switch must be in FM position. Tuning procedures are the same as for AM reception (part 2 of this section) except that an FM signal must be tuned "on the nose".

7. FREQUENCY MEASURING.

For AM and single-sideband reception, the 75A-3 dial reading will not necessarily correspond to the carrier frequency of the station being received. Depending upon whether the upper or lower sideband is tuned, the actual carrier frequency will be approximately 1.5 kc lower or higher than the dial reading indicates. For CW reception, if the CW station is properly tuned, the dial reading should correspond to the carrier frequency. More accurate frequency measuring procedures are outlined below:

a. Calibration: Frequency readings will be more accurate if an 8R-1 calibrator unit is used to calibrate the dial before frequency measurements are made. To use the calibrator, set up for CW reception (part 4, paragraph a. of this section), tune to the 100-kc point nearest the frequency to be measured, set the BFO PITCH control to center position, and turn on the calibrator. Zero beat the calibrator signal, using the main tuning control. Adjust the ZERO SET knob so that the dial marker lines up with zero on the KILOCYCLE dial. Turn off the calibrator.

If a 100-kc calibrator is not available, line up

the dial marker using WWV at 2.5 mc, 15 mc, or 30 mc.

b. To measure the carrier frequency of an AM station, turn the SELECTIVITY control to 4, tune the station for maximum "S" meter reading, and read the frequency on the tuning dial.

c. For single-sideband carrier frequency determination, the BFO must be calibrated according to the instructions in part 3, paragraphs a. (1) through a. (7). With the single-sideband station properly tuned in and the BFO PITCH set

at +1500 cycles, the suppressed-carrier frequency is 1.5 kc higher than the dial reading indicates. If the BFO PITCH is set at -1500 cycles, subtract 1.5 kc from the dial reading.

NOTE

The instructions in b. and c. above assume that a 3-kc mechanical filter is used. If the BFO is calibrated for an 800-cycle filter, the calibration points for this filter will lie 400 cycles on either side of center.

SECTION IV

THEORY OF OPERATION

1. GENERAL.

The 75A-3 circuit consists of a crystal-controlled front end, a variable i-f system, a low-frequency converter stage and a fixed 455-kc i-f system (see block diagram, Fig. 4-1). In the fixed i-f system, a mechanical filter first provides the necessary selectivity-curve shaping. The 455-kc intermediate frequency is then amplified and fed to the detector and audio circuits. A 455-kc signal from the beat-frequency oscillator is injected at the detector stage for CW reception. The audio system uses separate noise limiters for CW and AM; the CW noise limiter is variable, and the clipping level of the AM noise limiter is automatically adjusted according to the strength of the incoming signal. The output stage feeds a 500-ohm load or a 4-ohm speaker.

2. TUNING.

All variable tuned circuits, including the first r-f stage, the variable i-f system and the variable frequency oscillator are operated by the main tuning control. The vernier tuning dial is coupled directly to the shaft of the variable-frequency oscillator. The other variable-tuned circuits, including the r-f stage and the variable i-f stages, are tuned by powdered iron slugs which are

attached to a common platform. The platform is moved up and down by means of a cam-driven mechanism which is coupled to the VFO shaft by means of split gears and metal bands. The 75A-3 uses a unique method of band switching in the r-f stage in which only the 80 and 160 meter coils are tuned by means of the main tuning mechanism, and coils for 40-10 meters are connected across the respective 80 meter coils. Varying the inductance of an 80-meter coil varies the total inductance, and therefore the resonant frequency, of the tuned circuit for the band in use.

3. RF CIRCUITS.

A simplified block diagram of the 75A-3 r-f system is shown in Figure 5-5. The first r-f stage feeds the mixer at the carrier frequency of the incoming signal. The coverage for each band is listed below:

160 meters	- 1.5 - 2.5 mc
80 meters	- 3.2 - 4.2 mc
40 meters	- 6.8 - 7.8 mc
20 meters	- 14.0 - 15.0 mc
15 meters	- 20.8 - 21.8 mc
11 meters	- 26.0 - 28.0 mc
10 meters	- 28.0 - 30.0 mc

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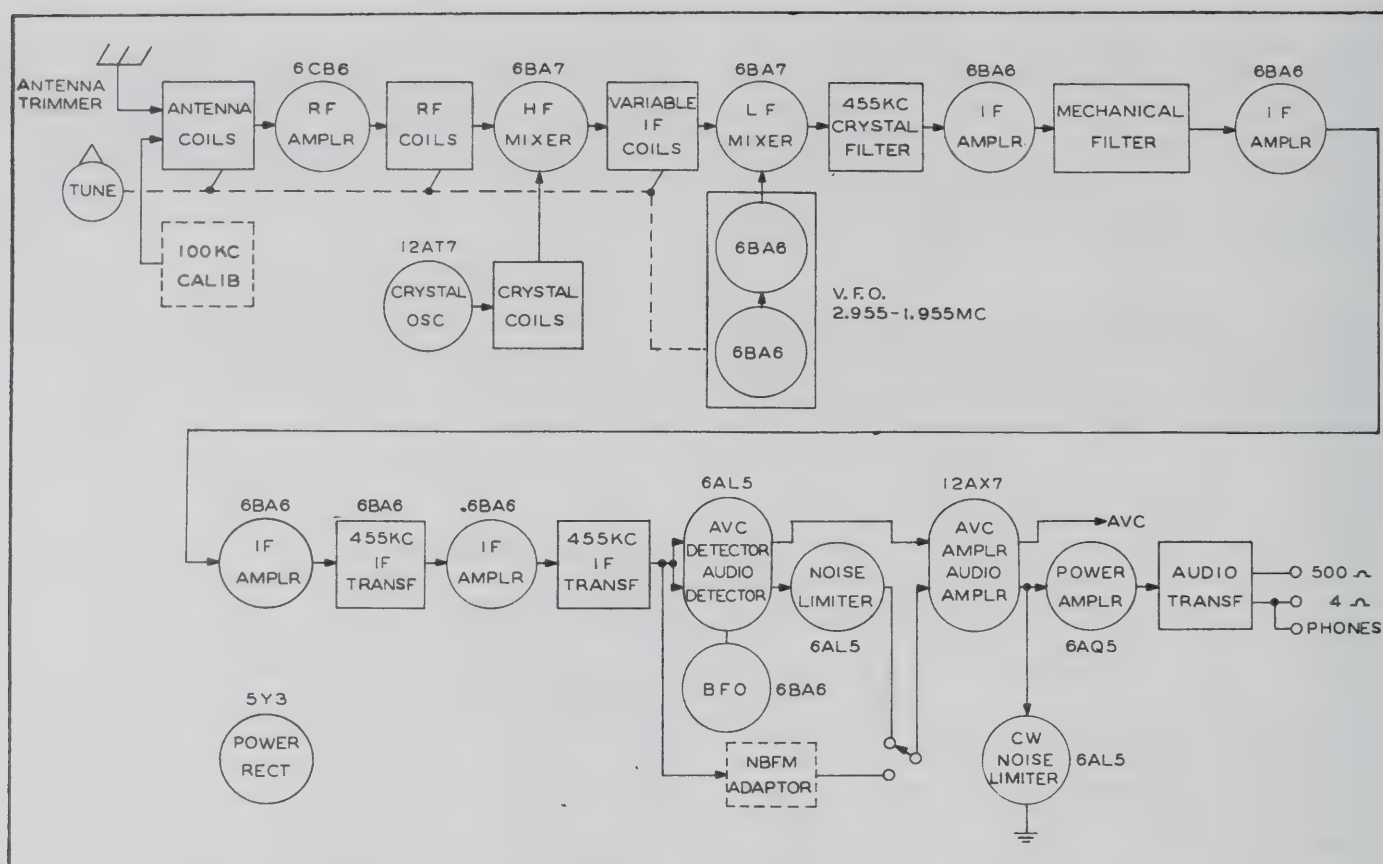


Figure 4-1. 75A-3 Block Diagram

The first converter, consisting of a crystal-controlled oscillator circuit and a mixer tube, converts the incoming signal to the variable i-f frequency of 2.5 - 1.5 mc for 160 - 15 meters and 5.455 - 3.455 mc for 11 and 10 meters. From the variable i-f system the signal is fed to the second mixer where it is converted to a fixed i-f frequency of 455 kc. This signal is passed through the i-f amplifiers to the detector stage. A discussion of individual circuits in the r-f portion of the receiver follows:

a. **RF STAGE.** The RF stage uses a 6CB6 pentode. Individual variable slug-tuned coils are switched into the grid circuit on 160 and 80 meters. On 40-10 meters the coil in use is connected across the 80-meter coil, and varying the inductance of the 80-meter coil tunes the coil for the band use. The 80-meter trimmer capacitors are not in the circuit on 40-10 meters.

On 160 meters the output of the r-f amplifier is fed directly to the variable i-f system. On 80-10 meters the r-f plate circuit tuning system is the same as that of the grid circuit.

b. **CRYSTAL - CONTROLLED OSCILLATOR AND FIRST MIXER.** The high-frequency converter stage employs a 12AT7 in a Butler crystal-oscillator circuit. In this circuit the crystal is connected between the cathodes of a dual triode. Feedback voltage is coupled from the plate circuit of one section, which contains a tank circuit resonant at the crystal frequency, to the grid of the other section. The 180-degree phase shift necessary for oscillation is provided by the second section of the tube, which acts as a cathode follower to couple feedback energy to the crystal. Crystal-oscillator output voltage is coupled to the injection grid of the 6BA7 first mixer. An individual crystal for each band is switched into the crystal oscillator circuit except on 160 meters, where the high-frequency converter is not used. The crystal-oscillator frequency beats with the incoming carrier to produce the first, or variable, intermediate frequency. In this stage because the crystal frequency is fixed and the incoming carrier frequency may be anywhere in the range of the band in use, the difference frequency produced in the mixer must be tuned by a variable i-f system.

On 160 meters the band coverage corresponds to the lower frequency range of the variable i-f's.

c. **VARIABLE IF.** The variable i-f system covers two frequency ranges, 2.5 - 1.5 mc and 5.455 - 3.455 mc. The variable i-f system for the range in use consists of two slug-tuned circuits on the same frequency. The first of these two circuits is capacity coupled to the second, which in turn is coupled to the control grid of the second mixer.

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d. **VFO AND SECOND MIXER.** A 70E-12 permeability-tuned precision variable frequency oscillator provides the injection voltage to the second mixer, a ~~6BA7~~ **6036**. The frequency range of the variable frequency oscillator is 1.955 - 2.955 mc. On 160-15 meters the 2.5 - 1.5 mc variable i-f frequency is mixed with the oscillator frequency to produce a difference frequency of 455 kc. On 11 and 10 meters the second harmonic of the variable frequency oscillator, 3.910 - 5.910 mc, is mixed with the variable i-f frequency of 5.455 - 3.455 mc to produce the 455-kc fixed intermediate frequency.

e. **CRYSTAL FILTER** (see Figure 4-2). The output of the second mixer is fed to the crystal filter. A 455-kc crystal, Y-7, acts as a very high Q resonant circuit which will pass only a narrow band of frequencies peaked sharply at 455 kc.

In order to neutralize the effect of the capacity between the crystal holder plates, phasing capacitor C-58 feeds a small out-of-phase voltage to the crystal filter output circuit. The phasing capacitor serves another purpose: If the phasing capacitor is adjusted so that the crystal holder capacity is not quite balanced out, the crystal forms, in addition to its series resonant circuit, a parallel resonant circuit slightly higher or lower in frequency than 455 kc, depending upon the setting of the phasing capacitor. Signals at this parallel resonant frequency are prevented from passing through the crystal circuit. Thus, the phasing control can be used to "notch out" interfering heterodynes close to the operating frequency. C-58 is a two-section capacitor; as the capacity of one section increases, the capacity of the other section decreases. By this means a capacity balance is obtained so that adjusting the phasing capacitor does not detune L-24.

A five-position switch, S-2, inserts various resistances in series with the crystal. The series resistor "de-Q's" the crystal so that the value of

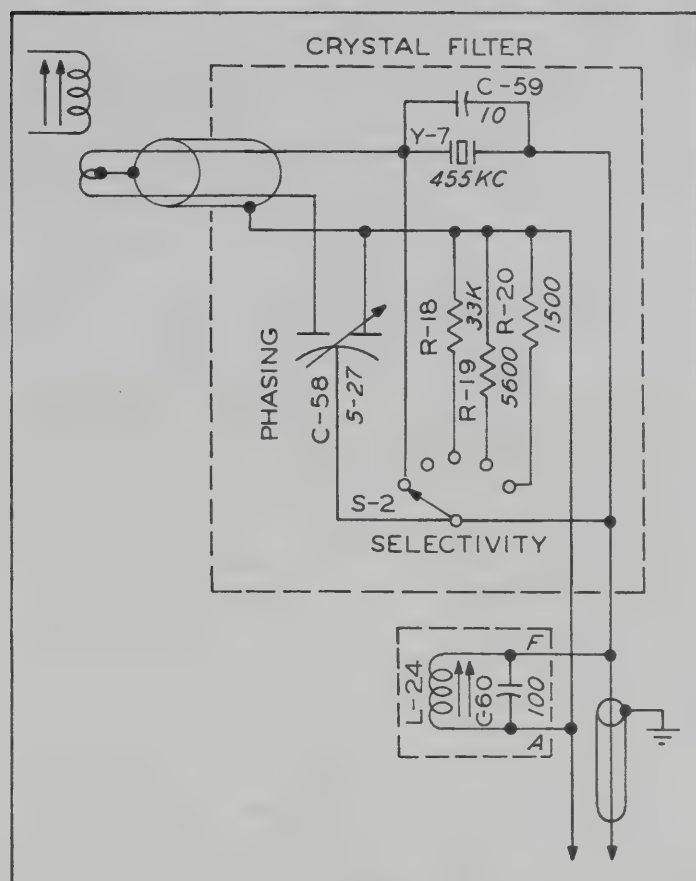


Figure 4-2. 75A-3 Crystal Filter

the resistor determines the bandpass of the crystal filter circuit. In position "O" the crystal is shorted so that the input circuit feeds directly to the output circuit. In position "1" the crystal is in series with the parallel resonant i-f coil L-24 so that the crystal looks into a high impedance at 455 kc and is not fully effective. In positions 2 through 4, increasingly lower values of resistance are inserted in series with the crystal to increase the effective Q of the crystal circuit and thus provide greater degrees of selectivity.

f. **MECHANICAL FILTER.** The functional schematic diagram of the Collins Mechanical Filter is shown in figure 4-3. The mechanical filter uses the principle of magnetostriction to convert oscillating magnetic energy to mechanical vibration. The magnetostriction transducer input coil is resonated at 455 kc. A nickel wire within this coil vibrates mechanically and transmits this mechanical energy to the first of a series of nickel alloy discs. The mechanical vibration of this first disc is coupled to succeeding discs by means of nickel-wire coupling elements. Biasing magnets at either end of the mechanical filter polarize the

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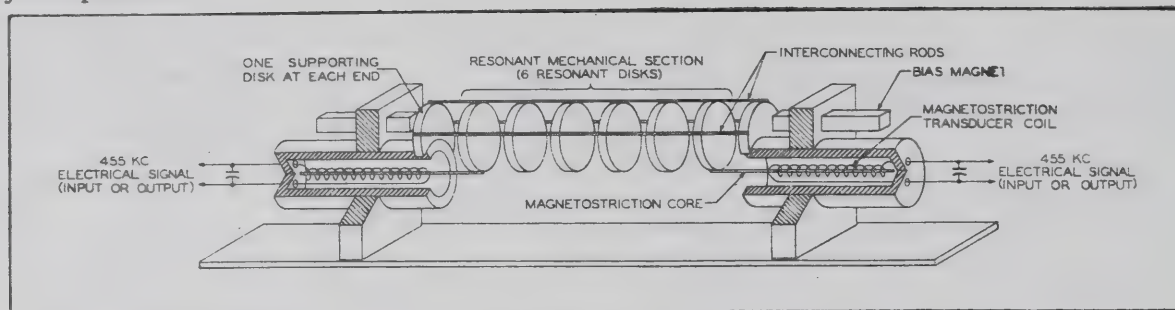


Figure 4-3. Collins Mechanical Filter, Functional Diagram

filter elements to prevent frequency doubling, in much the same manner as biasing magnets in a headphone prevent the headphone diaphragm from bending in the same direction for both halves of an a-c cycle. The mechanical vibration of the last disc is coupled to a magnetostriction transducer element identical to the one used at the input of the filter. By a reverse principle of magnetostriction, the mechanical vibration of the nickel-wire transducer core is converted to electrical impulses.

Each of the discs employed in the mechanical filter has a mechanically resonant Q exceeding 2,000. Six of these discs are overcoupled to produce a mechanically-shaped response curve with a flat top and straight, almost vertical sides. Thus, the filter passes a band of frequencies very little wider than the flat top of the selectivity curve. The mechanical filter used in the 75A-3 passes a band of frequencies approximately 3 kc wide and centered on 455 kc, providing an i-f selectivity curve ideal for the reception of AM and single-sideband signals. The 3-kc filter is supplied as part of the 75A-3; however, a mechanical filter having similar selectivity characteristics but having a bandpass of 800 cycles is available for use in CW reception or in 'phone reception under conditions of extremely heavy QRM or QRN.

g. 455-KC IF. The rest of the i-f system consists of three 6BA6 455-kc i-f amplifiers. The first of these is broad-tuned and is coupled to the two succeeding amplifiers, V-6 and V-7. The output of V-7 is coupled to the detector.

h. BFO. The BFO uses a 6BA6 in an electron-coupled oscillator circuit whose frequency range is approximately 453-457 kc. The BFO is tuned by means of a knob on the front panel.

i. "S" METER (see main schematic, figure 5-6). The "S" meter is connected in a bridge circuit between the screen grids of i-f amplifiers V-5 and V-6 and the cathode of i-f amplifier V-7. A reference voltage is developed at the negative

pole of the "S" meter by the cathode current flow of V-7. This reference voltage is adjusted under no-signal conditions to a value equal to that developed on the positive pole of the "S" meter by the two i-f amplifier screen-grid voltages. The presence of a signal in the i-f strip causes an AVC voltage to be developed which reduces the screen-grid current of the two i-f amplifiers, causing the screen-grid voltage on these tubes to increase. This increase in voltage is applied to the positive pole of the "S" meter to produce an "S" meter reading proportional to the strength of the incoming signal.

4. AUDIO CIRCUITS.

a. DETECTOR AND AVC (see figure 4-4). One section of V-8 is the detector. The other section is the AVC rectifier, which is coupled to the secondary of T-7 through C-80. The AVC control voltage is developed across R-32 and applied to the grid of the AVC amplifier, one section of V-9, through an audio filter network consisting of R-33 and C-81. The network consisting of R-35, C-82, and R-34 introduces degeneration to prevent the AVC amplifier from responding to low audio frequencies.

When no signal is entering the AVC rectifier, the AVC amplifier plate current is cut off by a bias of approximately 11 volts, which is obtained from bias load resistor R-36. Hence, the AVC amplifier does not function to reduce the sensitivity of the receiver until the voltage developed by the AVC rectifier reduces the AVC amplifier grid voltage to less than cutoff. Plate voltage for the AVC amplifier is developed across R-37 and R-38, two bias load resistors. The plate load across which the AVC voltage is developed is R-55.

The AVC circuit is disabled for CW. In CW position of the CW-AM-FM switch, the AVC amplifier plate circuit is broken, and a variable bias, adjusted by means of RF gain control R-57, is applied to the AVC line from the junction of R-57

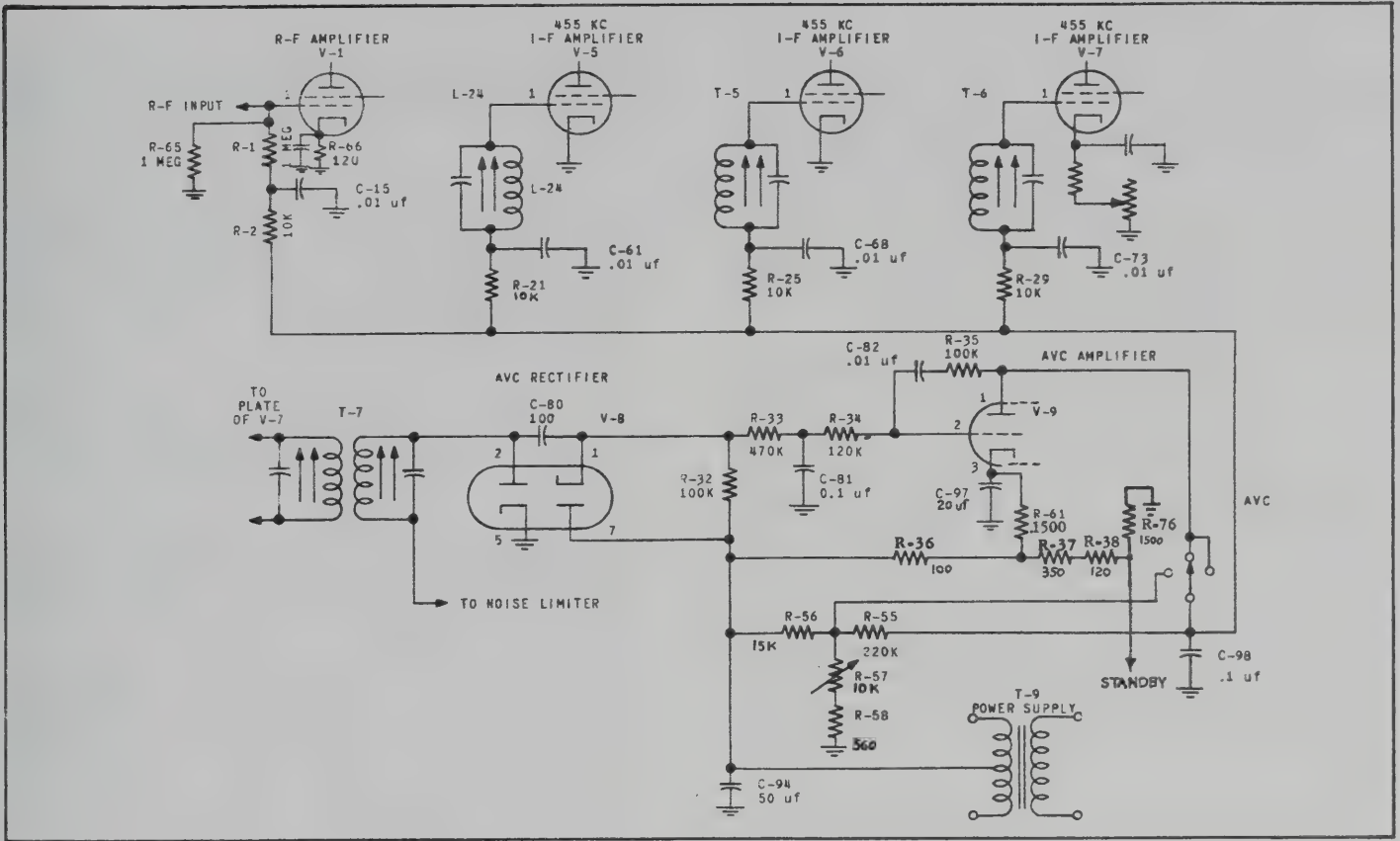


Figure 4-4. Detector and AVC Circuits

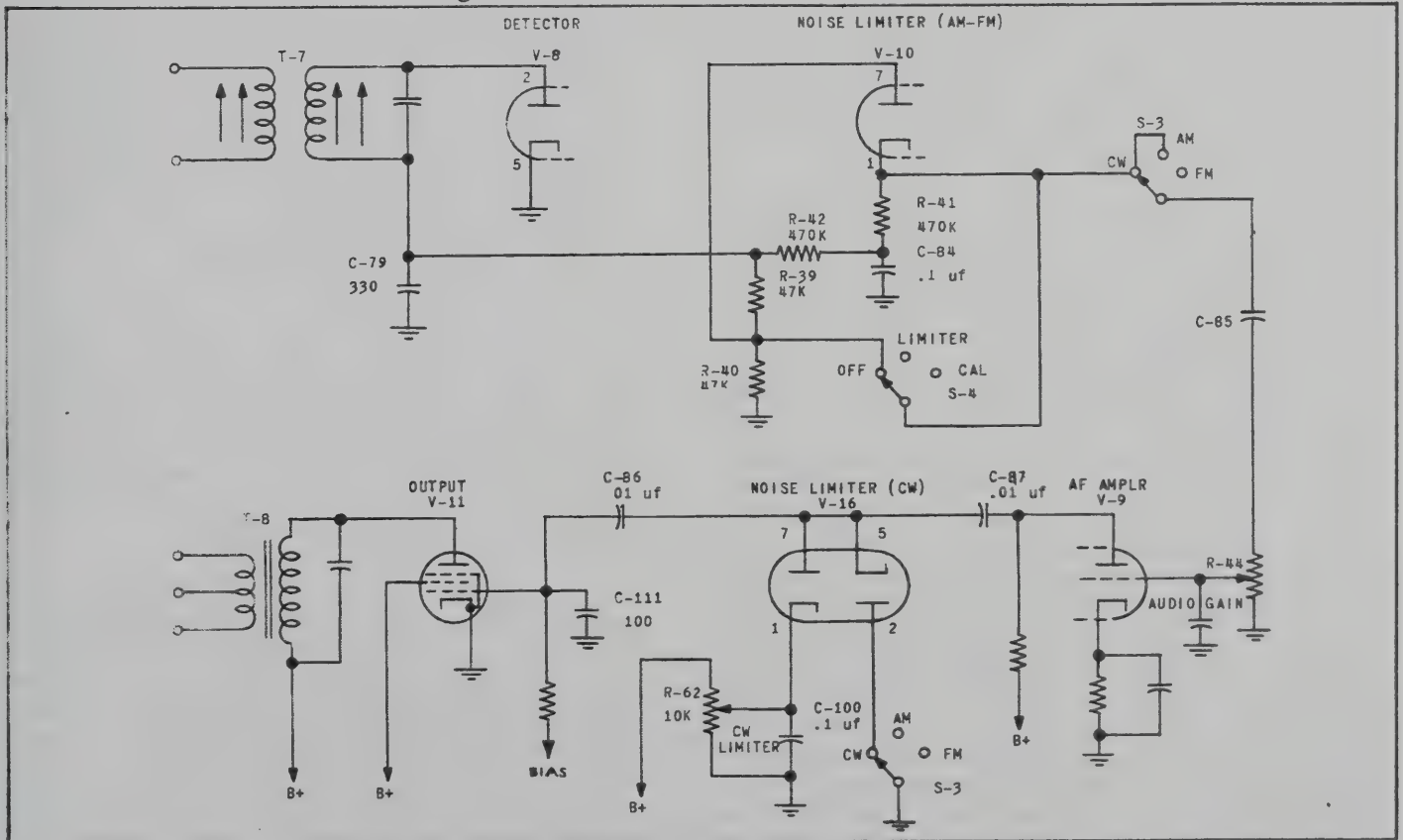


Figure 4-5. Noise Limiters and Audio Amplifiers

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and R-56, permitting manual volume control.

b. **NOISE LIMITERS** (see figure 4-5). The 75A-3 employs separate noise limiters for AM and CW. The AM noise limiter automatically adjusts its clipping level according to the strength of the incoming signal. The clipping level of the CW noise limiter is adjusted by means of a knob on the front panel.

(1) **AM NOISE LIMITER.** The audio voltage developed at the junction of R-40 and R-39, the diode load resistors, is applied to the noise limiter plate. A filter network consisting of R-42 and C-84 filters the audio component from the voltage developed across the diode load resistors, and this voltage is applied to the noise limiter cathode. When a negative noise peak exceeds the noise limiter bias, the diode ceases to conduct so that the noise voltage is not developed across noise limiter load resistor R-41. Noise limiter bias, and hence the negative peak-clipping level, is proportional to the strength of the incoming signal.

Positive noise peaks are not clipped by the AM noise limiter, but by the diode detector. Because the diode load network has a relatively large time constant and will not follow sudden drops in applied voltage, noise peaks resulting from sharp decreases in the carrier envelope (which would appear as positive peaks at the detector output) are effectively clipped in the detector stage.

(2) **CW NOISE LIMITER.** The CW noise limiter is a shunt-type clipper employing 6AL5 dual diode, V-16. If clipping level control R-62 is set at minimum clipping, or B+, and a sine wave is applied to the input of the limiter (junction of pins 5 and 7) the section between pins 2 and 5 will at first draw a current until capacitors C-87 and C-86 are charged positive to exactly the peak audio input voltage. The signal at the junction of pins 5 and 7 will then swing between 0 and 2 times the peak applied audio voltage. No clipping will occur. Now if the arm of clipping level control R-62 is advanced toward ground, the diode section between pins 1 and 7 will conduct when the positive signal voltage exceeds the voltage applied to the cathode. At this time the positive signal will be clipped, and capacitors C-87 and C-86 will be discharging by an amount equal to the difference in voltage between the d-c cathode voltage and the peak positive voltage of the applied audio. The negative half-cycle will then be clipped when the cathode of the section between pins 2 and 5 becomes negative with respect to the plate. When this occurs, capacitor C-87 and C-86 will again

charge to the original voltage of the audio signal, preparing the section between pins 1 and 7 to again clip the positive peak.

c. **AUDIO AMPLIFIERS.** The first audio stage is one triode section of V-9. This stage provides grid swing to the output tube, V-11. Grid bias for V-11 is obtained from a fixed bias source, a point on the voltage divider in the negative lead of the power supply.

The output transformer secondary delivers approximately 2 watts of audio to a 500-ohm or a 4-ohm load. The 4-ohm output may be connected to the voice coil of a speaker. The front-panel headphone jack is interlocked with the speaker output connection so that inserting a headphone jack disconnects the speaker. A 10-ohm load resistor is connected across the 4-ohm output when the headphone plug is inserted.

Standby and muting circuits are provided to disable the receiver audio section when an associated transmitter is operating (see main schematic, figure 5-6). The standby connection is provided to insert R-76, a 1500-ohm resistor, in series with the bias load resistors to increase the bias on the output tube and cut off the plate current. The muting circuit is provided for receiver silencing in break-in CW operation. A positive potential of 20 volts applied to pin 2 of the 6AL5 causes plate current flow in the diode, whose cathode is connected to the audio amplifier cathode (pin 8 of V-9). Current flows through the audio amplifier cathode resistor R-43 and increases the cathode bias sufficiently to cut off the plate current of the audio amplifier and silence the receiver.

5. 148C-1 NBFM ADAPTOR (see figure 5-7).

The 148C-1 NBFM adaptor employs a 6AU6 limiter and a 6AL5 frequency discriminator. Because of the high value of grid load resistor, R-201, the limiter tube operates on a nonlinear portion of its characteristic curve and will not respond to changes in signal amplitude.

The discriminator circuit used in this adaptor relies on the phase difference between the primary and secondary potentials of a doubly tuned, loosely coupled transformer, T-201. At resonance the phase difference is 90° but varies above and below this value as the input frequency varies. A pair of coupling capacitors, C-204 and C-205, introduce to the secondary circuit a voltage in phase with the primary voltage. This voltage appears in the same phase and with equal amplitude at each plate of 6AL5 discriminator. The second-

ary voltage of T-201, however, changes in phase according to the magnitude and direction of frequency swing, and appears at the plates of the discriminator 180° out of phase.

Thus as the phase of the secondary voltage of T-201 changes with the change in frequency, the secondary voltage and the applied primary voltage add at one end of the secondary and subtract at the other. When the frequency swings in the other direction, the secondary voltage and the applied primary voltage shift in phase relationship to produce more r-f at the other end of the secondary. The 6AL5 rectifies the r-f to produce an a-c audio voltage across load resistors R-206 and R-207.

The audio voltage is fed to the output pin of P-203, the adaptor plug, thru a de-emphasis network, R-208 and C-208. The adaptor unit is connected into the 75A-3 circuit when the CW-AM-FM switch is in FM position. Operating voltages for the adaptor are provided by the receiver power supply.

6. 8R-1 CALIBRATOR UNIT (see figure 5-8).

The calibrator unit uses a 6BA6 in a Pierce oscillator circuit. The oscillator provides usable harmonics each 100-kc to 30 mc.

Capacitor C-310 is provided for adjusting the oscillator to zero beat with a frequency standard, a 1500-kc or 1600-kc broadcast station, or WWV at 2.5, 15, or 30 mc (refer to Section III, part 7, for calibration and frequency measuring procedures).

Calibrator output is coupled to the grid of r-f amplifier tube V-1 by means of the capacity between pins 3 and 4 of the crystal calibrator socket.

The calibrator receives its operating voltages from the receiver power supply. The oscillator is energized when the OUT-LIMITER-CAL. switch on the receiver front panel is in CAL. position.

SECTION V MAINTENANCE

1. TROUBLE SHOOTING.

The table of resistance and voltage measurements located at the end of the alignment procedure will help in locating troubles which might arise in the 75A-3. Most normal receiver troubles such as burned out tubes, loose connectors, noisy volume controls, etc., are easily discovered and remedied. However, should more obscure troubles arise, only a trained and competent repairman should be allowed to service the receiver.

2. FUSE.

The 75A-3 is supplied with a 2-ampere fuse. If the fuse blows, do not replace it until the cause of the trouble has been determined and remedied. Use only a 2-ampere fuse.

3. TEST EQUIPMENT REQUIRED FOR 75A-3 ALIGNMENT.

a. Signal generator.

b. Vacuum tube voltmeter.

c. Swamping tool - .01 uf capacitor in series with 1000-ohm resistor. Alligator clip on each end.

4. 455-KC IF ALIGNMENT.

a. CONTROL SETTINGS.

(1) CW-AM-FM control to AM.

(2) BAND CHANGE on 80.

(3) 3-kc filter in circuit.

(4) SELECTIVITY on 0.

b. PROCEDURE.

(1) Connect VTVM d-c lead to diode load (junction of R-39 and R-42).

(2) Connect signal generator output to receiver antenna terminals. Set signal generator to some frequency in the 80-meter band. Do not move signal generator frequency during the rest of the 455-kc i-f alignment procedure.

(3) Tune receiver to exact signal frequency.

(4) Adjust RF GAIN control for an "S" meter reading of S-9 +20 db.

(5) Tune receiver to the S-9 point on the high-frequency side of the signal. Record the dial reading.

(6) Tune the receiver to the S-9 point on the low-frequency side of the signal. Record the dial reading.

(7) Set the dial halfway between the readings determined in steps (5) and (6). Adjust T-3 trimmer core for maximum diode load voltage. Connect the swamping tool between terminal D of T-6 and ground. Adjust the bottom trimmer screw of T-6 for maximum reading on VTVM. Adjust signal generator output during this and the following procedures so that the VTVM reads less than 5 v.

(8) Connect the swamping tool between terminal D of T-7 and ground. Adjust bottom trimmer of T-7 for maximum VTVM reading.

(9) Connect the swamping tool between terminal A of T-6 and ground. Adjust the top trimmer of T-6 for maximum VTVM reading.

(10) Connect the swamping tool between terminal A of T-7 and ground. Adjust top trimmer of T-7 for maximum VTVM reading.

(11) Turn the SELECTIVITY control to 4. Carefully tune signal generator until maximum diode load voltage is obtained; maintain the input below the AVC threshold (approx. 8 volts across diode load).

(12) Turn SELECTIVITY control to 1. Move the signal generator frequency approximately 1.5 kc lower or until VTVM reading begins to drop sharply.

(13) Adjust L-24 for maximum output indication.

(14) Set phasing control knob so that minimum hiss occurs at center position.

5. BFO ALIGNMENT. Connect the signal generator to the antenna terminals and tune both the receiver and signal generator to the 80-meter band. Turn the SELECTIVITY control to 4. Turn the AM-CW-FM control to AM and tune the signal generator to the exact crystal frequency as indicated by a sharp rise in the "S" meter reading. Set the BFO PITCH control to center position. Set the CW-AM-FM switch to CW and adjust the BFO trimmer (in the top of L-27) to zero beat.

If the knobs have previously been removed, it is likely that the BFO PITCH knob will have been replaced incorrectly. The BFO PITCH knob should be centered with the BFO tuning capacitor set at half capacity. To check the position of the capacitor, proceed as follows: Connect the signal generator to pin 7 of V-4 and turn the CW-AM-FM switch to CW. Rotate the BFO PITCH control 90° either side of center position. The tone should change an equal amount on each side of center position. If it does not, center position of the knob does not correspond to half-capacity setting of the BFO capacitor.

To correct this condition, first rotate the control for the highest pitch obtainable. The capacitor is now either at minimum or maximum. Loosen the BFO PITCH knob and rotate it 90° to the right or to the left of center position. Tighten the set screw. Return the knob marker to center position and adjust the BFO trimmer to zero beat.

It is now possible that the BFO knob is set 180° from its proper position on the BFO control shaft. To check for this condition, loosely couple the signal generator to the antenna connections on the receiver. Set up the receiver for CW reception, and set the BFO PITCH control at center position. Zero beat the signal generator signal by means of the main tuning dial of the receiver.

Rotate the BFO PITCH knob to +1. Again zero beat by means of the main tuning dial. If the dial indicates 1 kc less than the previous reading, the BFO knob is set correctly. If the tuning dial indicates 1 kc more, the BFO knob should be loosened and rotated exactly 180° on the shaft.

6. CRYSTAL OSCILLATOR ADJUSTMENT.

a. Connect lead of VTVM through 1 meg isolating resistor to pin 7 of V-2.

b. Turn bandswitch knob to 80. Adjust L-12 for maximum output indication.

c. Adjust L-13 through L-17 successively for 40 through 10 meters, respectively.

d. The frequency of the crystal oscillator can be adjusted over a limited range by the controls mentioned in steps b. and c. above. After the rest of the receiver is aligned, this feature may be used to reduce the calibration error between bands.

To trim the crystal frequency to achieve maximum calibration accuracy, first couple the receiver to the output of an accurate frequency standard providing harmonically related output every 100 kc.

Turn on the BFO and tune to zero beat at 2.000 mc. Do not turn tuning dial or BFO PITCH knob during the rest of this procedure. Turn BAND CHANGE control successively to the remaining bands, and on each adjust the receiver to zero beat by adjusting the oscillator coil for that band.

Detuning the crystal oscillator may cause the crystal to stop oscillating if a large adjustment is necessary. If this is the case, tune instead for maximum output and use the ZERO SET control to obtain exact calibration for that band.

7. VARIABLE IF ALIGNMENT.

a. EQUIPMENT SETUP.

(1) Connect signal generator output to pin 7 of the first mixer, V-2.

(2) Connect VTVM at diode load resistor (junction of R-39 and R-42).

(3) Set the front panel controls as follows: OFF-STANDY-ON switch in ON position, CW - AM-FM switch to AM, SELECTIVITY to 0, CRYSTAL FILTER PHASING in center position,

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AUDIO GAIN maximum, BAND CHANGE switch on 80 meters.

b. 2.5 - 1.5 MC IF ALIGNMENT.

(1) Set dial at 4.1 mc. Adjust signal generator to 1.6 mc. Adjust tuning cores L-18 and L-22 for maximum output indication.

(2) Set receiver dial to 3.3 mc. Adjust signal generator to 2.4 mc. Adjust trimmers C-46 and C-53 for maximum output.

(3) Repeat steps (1) and (2) until no further increase can be obtained.

c. 5.455 - 3.455 MC IF ALIGNMENT.

(1) Turn BAND CHANGE switch to 10.

(2) Set dial at 30.0 mc. Adjust signal generator to 3.455 mc. Adjust tuning cores L-19 and L-23 for maximum output indication.

(3) Set dial at 28.0 mc. Adjust signal generator to 5.455 mc. Adjust trimmers C-43 and C-51 for maximum output indication.

(4) Repeat steps (2) and (3) until no further increase can be obtained.

d. TWEET TRAP ADJUSTMENT. A Third order tweet appears at 3533 kc in the 80 meter CW band and is caused by the signal of the 5.7 mc crystal

beating with the second harmonic of the VFO at the mixer, V4. A coil, L-21, series resonant with C-52 and C-53 at 5.7 mc, effectively reduces this tweet.

To adjust L-21, turn on the BFO, tune in the tweet, and adjust the core until the tweet is at a minimum.

8. RF ALIGNMENT.

a. EQUIPMENT SETUP.

(1) Connect signal generator lead to antenna connection of receiver.

(2) Connect VTVM at diode resistor (junction of R-39 and R-42).

b. PROCEDURE.

(1) Set bandswitch on 160 meters. Tune the receiver and signal generator to 1.6 mc. Adjust T1 tuning core for a maximum output indication.

(2) Tune the receiver and signal generator to 2.4 mc and peak capacitor C5 for maximum output.

(3) Repeat steps (1) and (2) until no further increase can be obtained.

(4) Repeat for other bands using the following table as a guide.

	RECEIVER AND SIGNAL GEN. LOW END.	RF INDUC- TOR	ANT INDUC- TOR	RECEIVER AND SIGNAL GEN. HIGH END.	RF CAPACI- TOR	ANT CAPACI- TOR
160	1.6		T1	2.4		C5
80	3.3	L6	T2	4.1	C21	C6
40	6.9	L7	L1	7.7	C18	C7
20	14.1	L8	L2	14.9	C19	C8
15	20.9	L9	L3	21.7	C20	C9
11	26.2	L10	L4	27.8	C25	C10
10	28.2	L11	L5	29.8	C26	C11

9. 148C-1 NBFM ADAPTOR ALIGNMENT.

Tune an unmodulated carrier "on the nose". Turn the CW-AM-FM control to the FM position. Connect a high-impedance d-c voltmeter between pin 2 of the NBFM adaptor socket and ground. Align as follows:

a. Detune the secondary of T-201 (top screw).

b. Tune the primary of T-201 (bottom screw accessible through a hole in the 75A-3 chassis) for maximum DC voltage indication.

c. Tune the secondary of T-201 (top screw) for zero d-c voltage indication. NOTE: There may be three minimum indications. The correct zero indication is the one at which, within a few turns of the screw, the voltmeter swings rapidly from a positive to a negative indication.

10. VFO ADJUSTMENT. The VFO is adjusted and sealed at the factory. It should not require further adjustment under normal circumstances. Should the oscillator be miscalibrated beyond the point at which the vernier dial corrector (ZERO SET control) can compensate, tune the receiver to an accurate 2000 kc frequency standard, set the vernier dial corrector to midscale, loosen two set screws on one half of the coupler on the oscillator shaft. Then carefully turn the oscillator shaft until zero beat is obtained.

Make final adjustment with the CW-AM-FM switch in AM position and SELECTIVITY control in position 4. Adjust the oscillator shaft for maximum indication on the "S" meter and maintain this while tightening screws in coupler on oscillator shaft.

The tuning rate of the VFO may be checked by setting the tuning dial to exact zero beat with a frequency standard at each end of one tuning range, (14.000 and 15.000 mc for example). The tuning dial travel between these two points should be 10 turns plus or minus 3 dial divisions. If the error is greater than 3 dial divisions the oscillator should be removed and returned to the factory for adjustment. Do not attempt to adjust the oscillator because breaking the seal will allow moisture to enter the oscillator and may cause excessive drift. After installing the repaired oscillator, it will be necessary to align the oscillator with the dial. To do this, carefully turn the oscillator shaft to the clockwise stop. **WARNING:** do not force the shaft. Set the vernier dial at 2.000 mc on the 160-meter band with the BFO on. Turn on the receiver and couple a 2000-kc frequency standard to pin 7 of V4. Rotate the oscillator shaft approximately 5 turns counterclockwise until a beat note is heard. Adjust to zero beat.

Make final adjustment with the CW-AM-FM control on AM and the SELECTIVITY control at position 4. Adjust oscillator shaft for maximum indication on "S" meter. Tighten set screws in coupler.

11. DIAL CORDS.

The front panel must be removed for replacement of the dial pointer cord or the drum rotator cord. Figure 5-2 shows both cords in place and the direction in which the restringing should proceed.

a. REMOVING FRONT PANEL.

- (1) Remove the receiver from its cabinet.

- (2) Remove the six panel screws.

- (3) Remove the following knobs:

CRYSTAL FILTER PHASING
SELECTIVITY
BFO PITCH (see CAUTION below)
ANT TRIM
BAND CHANGE
TUNING

CAUTION

Set the BFO PITCH control knob on the index mark (straight up) and do not move the control after the knob has been removed. If the control has been accidentally moved, see part 5 for instructions for adjusting the knob position.

- b. **POINTER CORD.** - Obtain at least 33 inches of Collins 432 1009 00 dial cord and tie loops in each end so that the cord is 29-3/8" long overall.

- (1) Turn the tuning knob to the clockwise stop.

- (2) Start at point X in the drawing with the cord hooked to one end of the spring (part number of spring is 503 1240 001).

- (3) Bring cord around pulley C to pulley B.

- (4) Wrap around pulley B clockwise, through the deep slot, around the tab, and back through the shallow slot. Wrap around pulley B two times clockwise.

- (5) Wrap cord around pulley A and loop the end on the free end of the spring.

- (6) Fasten the pointer to the cord, tune in a station of known frequency and adjust the pointer to the correct setting.

- (7) Replace the panel.

- c. **DRUM CORD.** - Obtain a 15-inch length of Collins 432 1009 00 cord and tie loops in each end 12 inches apart.

- (1) Turn the band switch to the 1.5 - 2.5 mc band (pulley D at counterclockwise stop).

- (2) Turn pulley E approximately one turn and hold the tension spring taut.

- (3) Make approximately 3/4 turn around pulley D and hook cord to tab.

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(4) Extend the cord around pulley E and hook to the tab. Release the tension spring.

(5) Replace the panel.

(6) Loosen the set screw in the drum hub opposite the coil tension spring, and align the dial calibration to the 1.5 - 2.5 mc band. Then tighten the set screw.

D. C. SOCKET VOLTAGES 75A-3

- Conditions: 1. AM
2. RF GAIN maximum
3. AF GAIN minimum
4. Band - 80 meters, no signal *3.2 - 4.2 mc.*
5. All voltages measured to ground with VTVM.

Tube No.	Tube Type	1	2	3	4	5	6	7	8	9
V ₁	60C6 6CB6	- .7	0 - .75	0	6.3AC	135	95	0 - .75		
V ₂	6BA7	90	.9	.9	6.3	0	0	0	0	135
V ₃	12AT7	125	0	1.1	0	0	125	-1.7 -2.4	1.1	6.3
V ₄	6BA7	+95	-1.7	.9	6.3AC	0	0	0	0	155
V ₅	6BA6	-1.55	0	0	6.3AC	168	72	0.5		
V ₆	6BA6	-1.55	0	0	6.3AC	152	80	0		
V ₇	6BA6	-1.55	1.25	0	6.3AC	158	84	1.25		
V ₈	6BA5	-45	-0.9	0	6.3AC	0	-48	-48		
V ₉	12AX7	-1.5	-43	-40	0	0	123	0	1.3	6.3
*V ₁₀	6AL5	-1.3	0	0	6.3AC	1.2	-2	-1.4		
V ₁₁	6AQ5	-12	0	0	6.3AC	180	165	-12		
**V ₁₂	6BA6	-7.7	0	0	6.3AC	23	70	0		
V ₁₃	5Y3GT	0	208	145	-55	0	-55	0	208	
V ₁₄	6BA6	-2.2	0	0	0	50	50	0		
V ₁₅	6BA6	-2.0	0	0	0	100	70	0		
V ₁₆	6AL5	23	0	0	6.3AC	0.3	0	0.3		
V ₁₇	OA2	0	0	0	0	150	0	0		

* Limiter on
** CW on

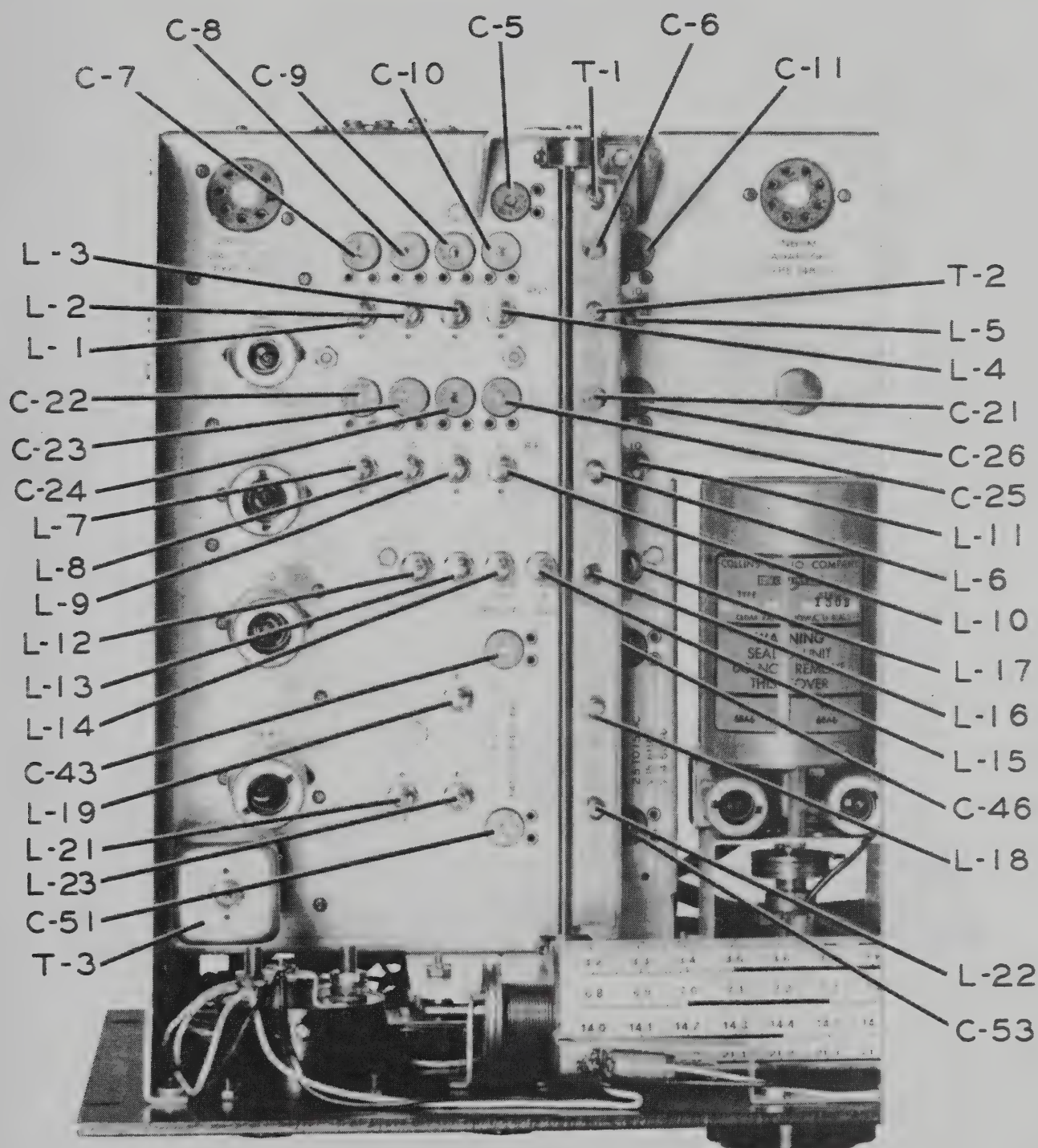


Figure 5-1. 75A-3 Alignment Adjustments

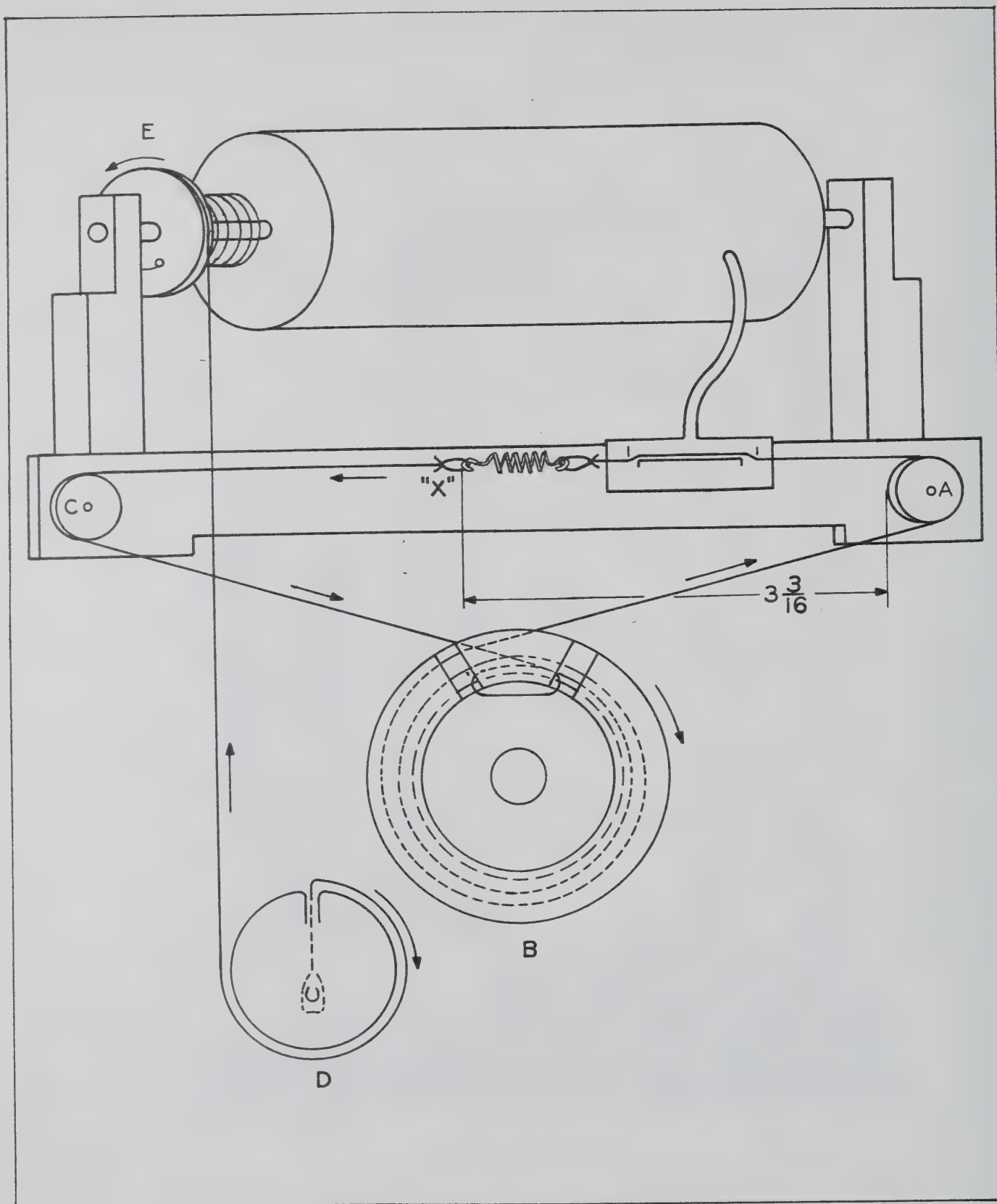


Figure 5-2. Dial Cord Replacement

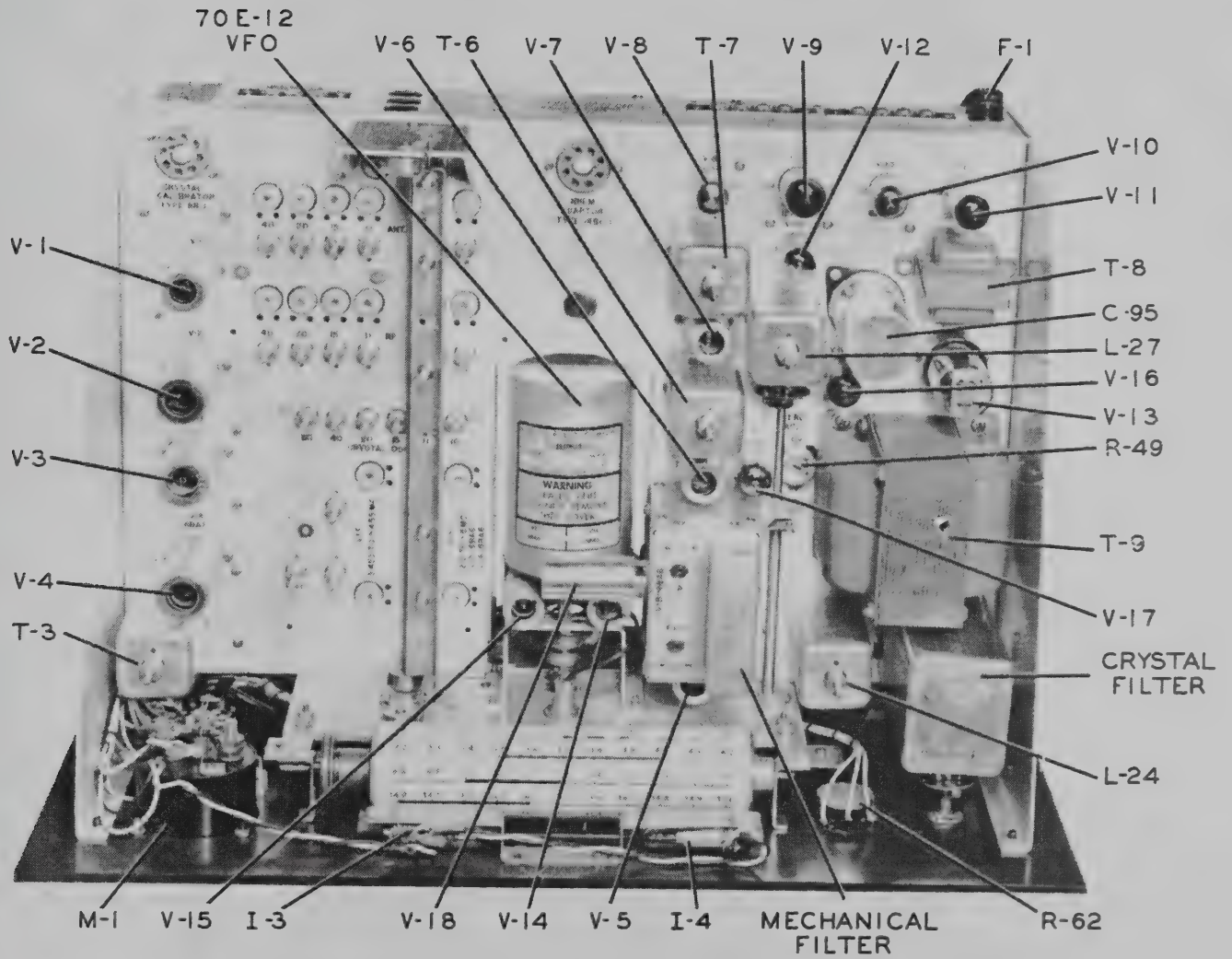


Figure 5-3. 75A-3 Receiver, Top View

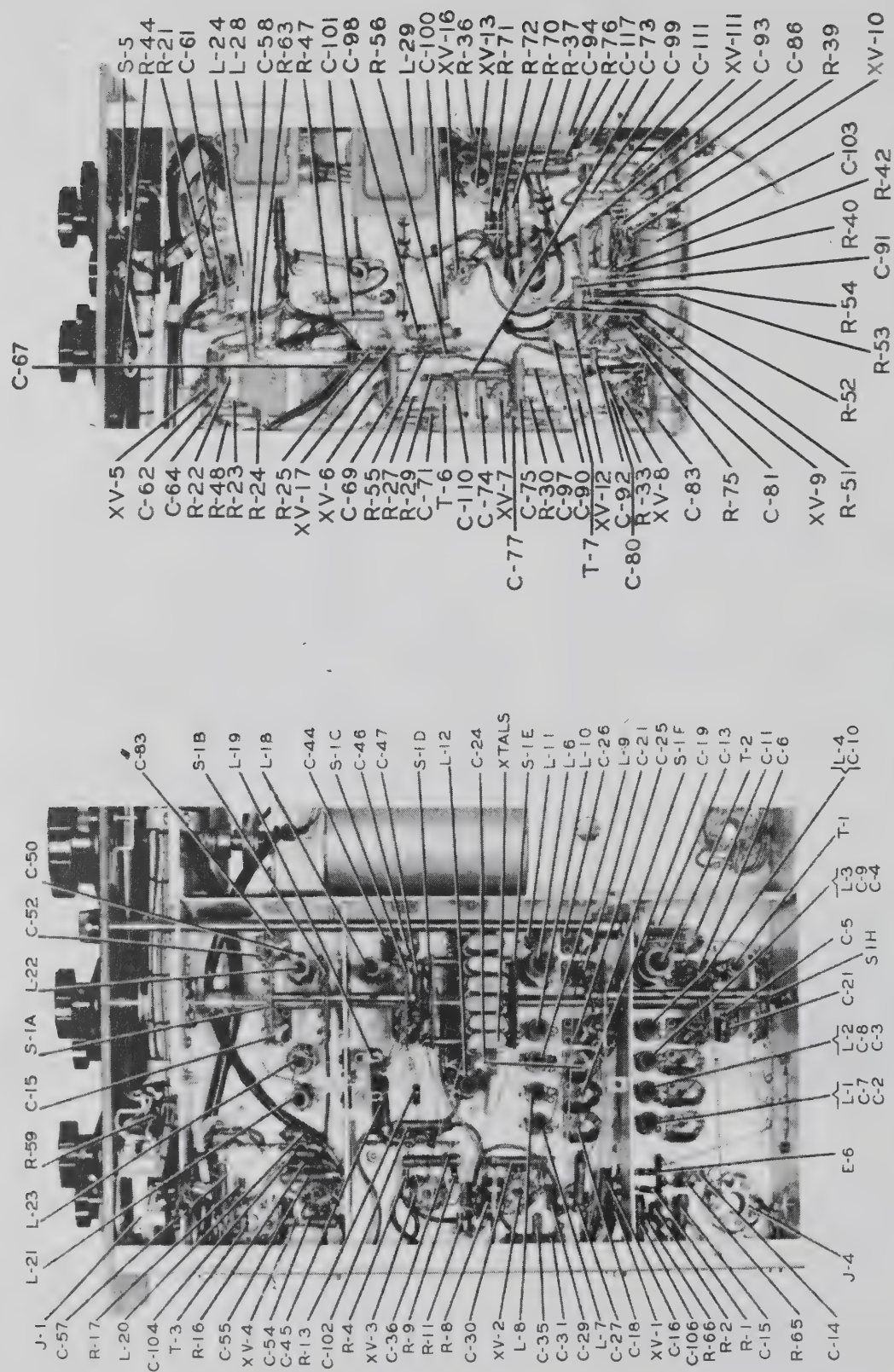


Figure 5-4. 75A-3 Receiver, Bottom View

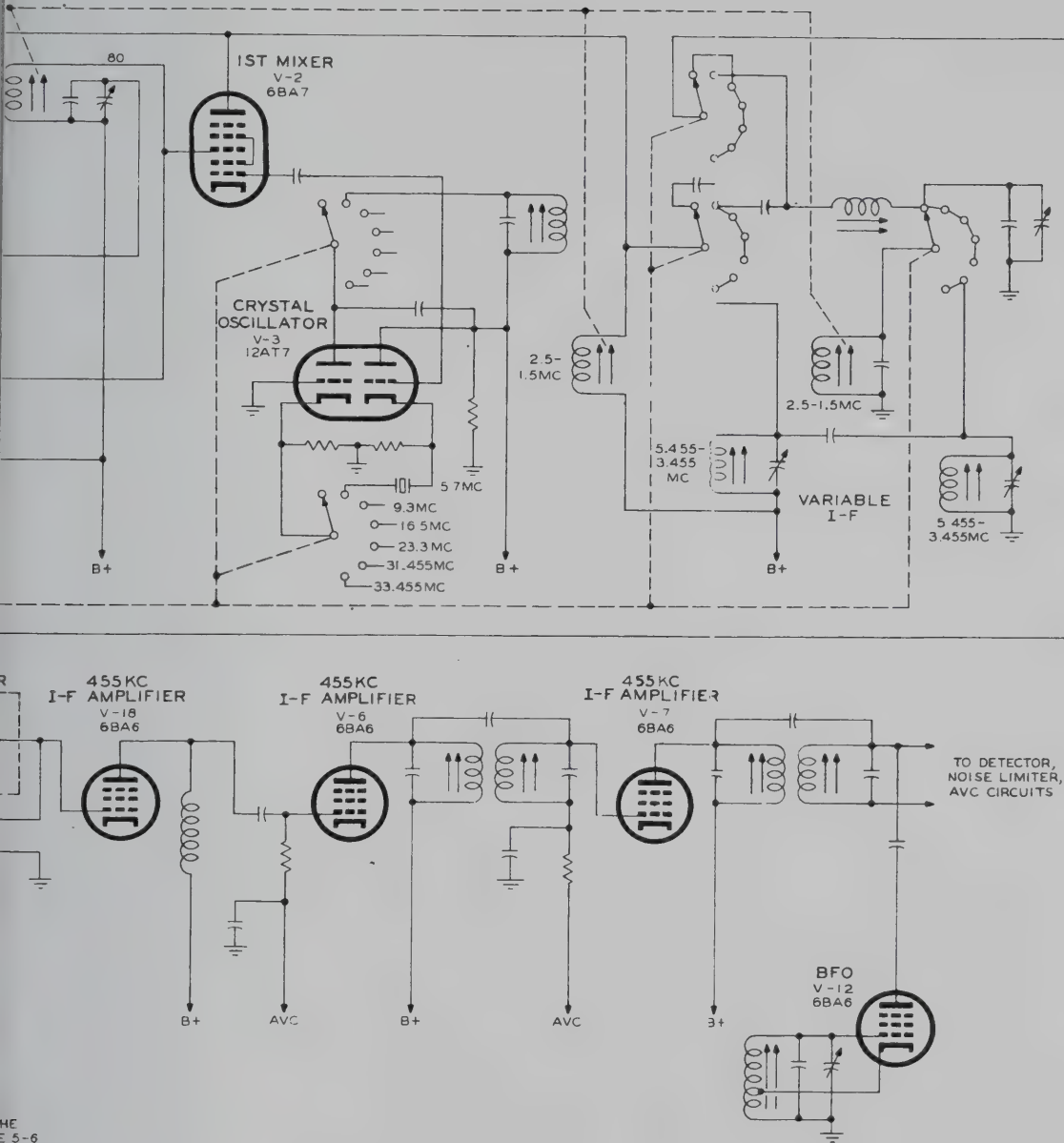
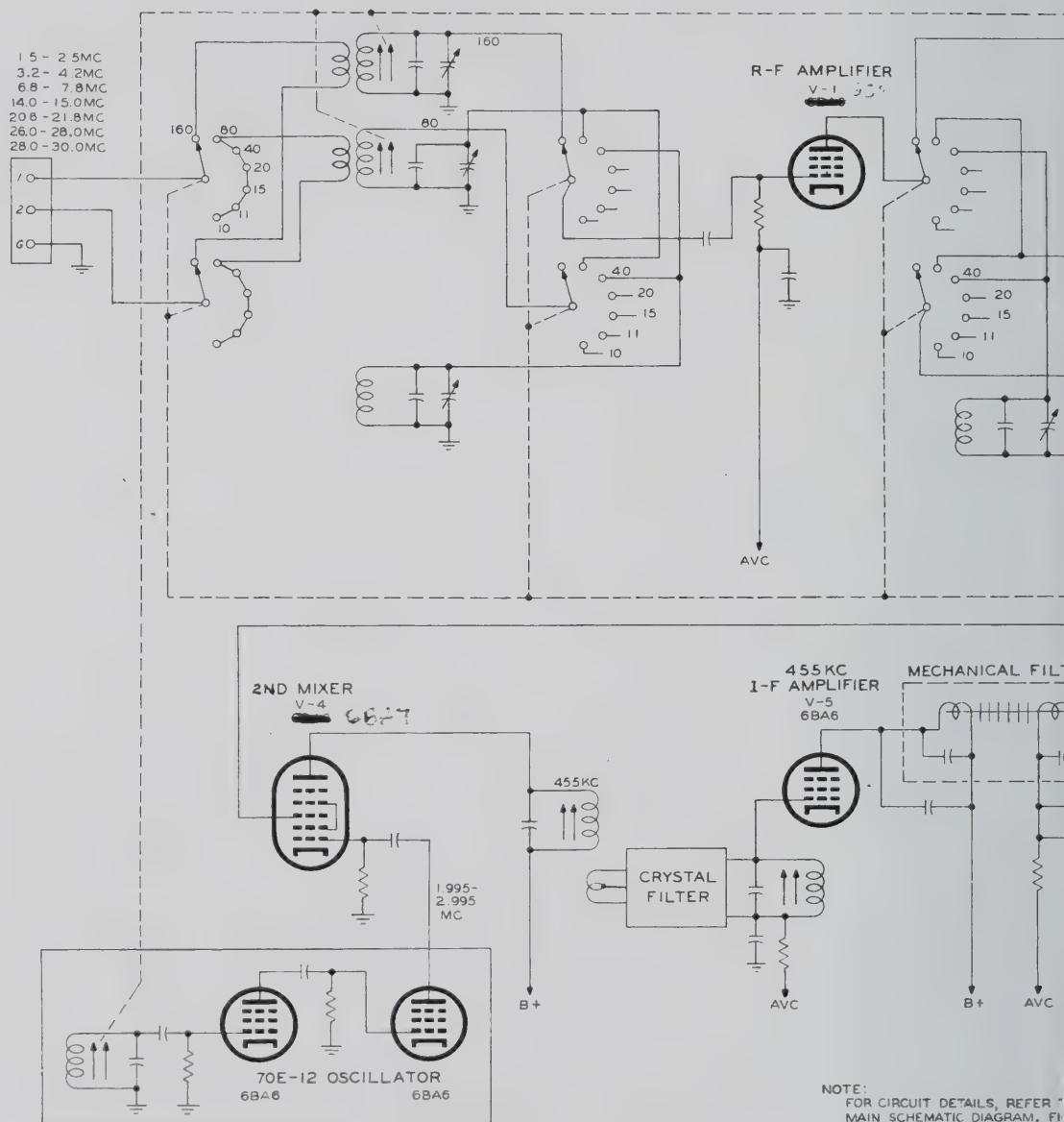
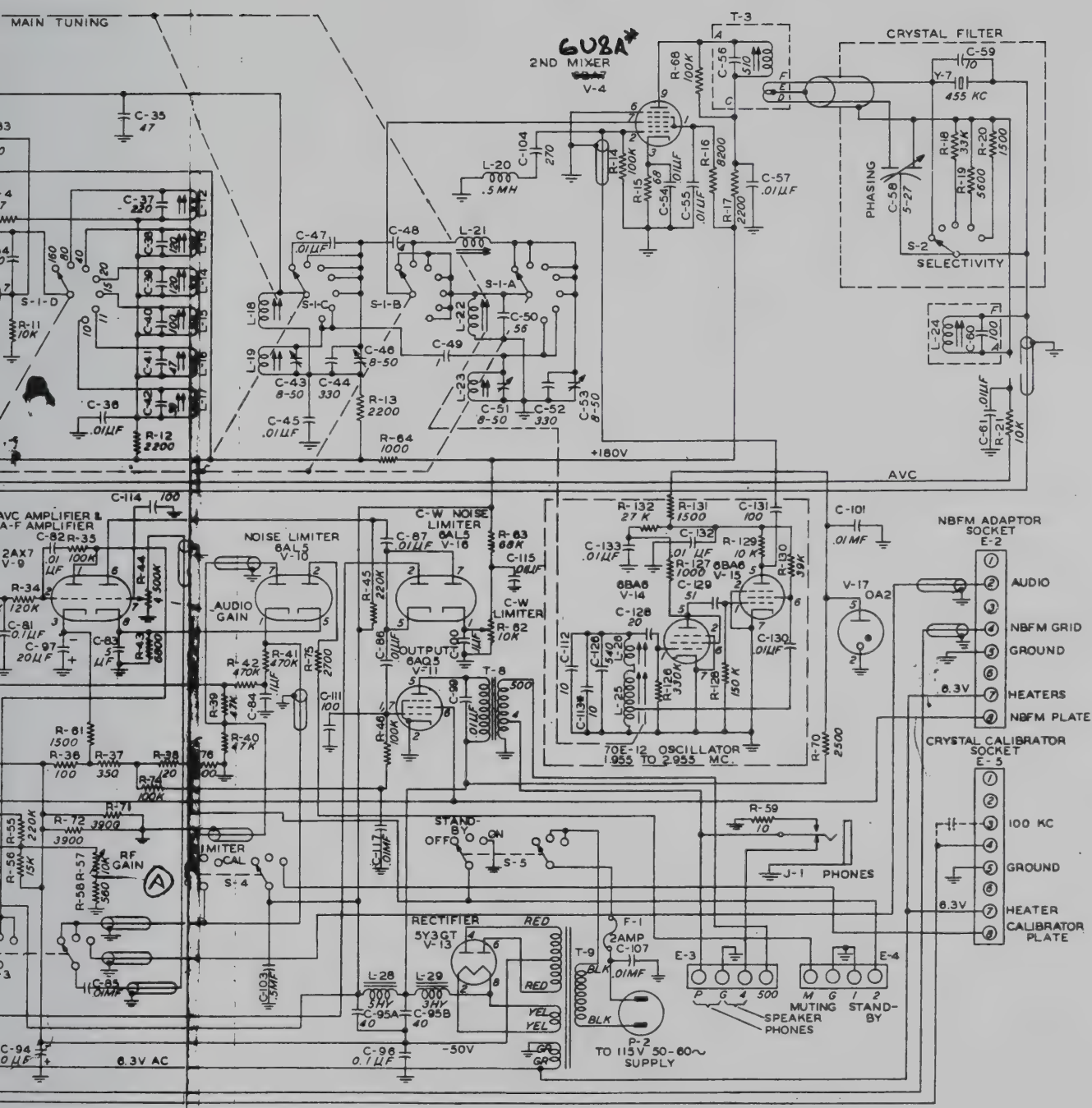


Figure 5-5. Simplified Schematic of 75A-3 RF Circuits



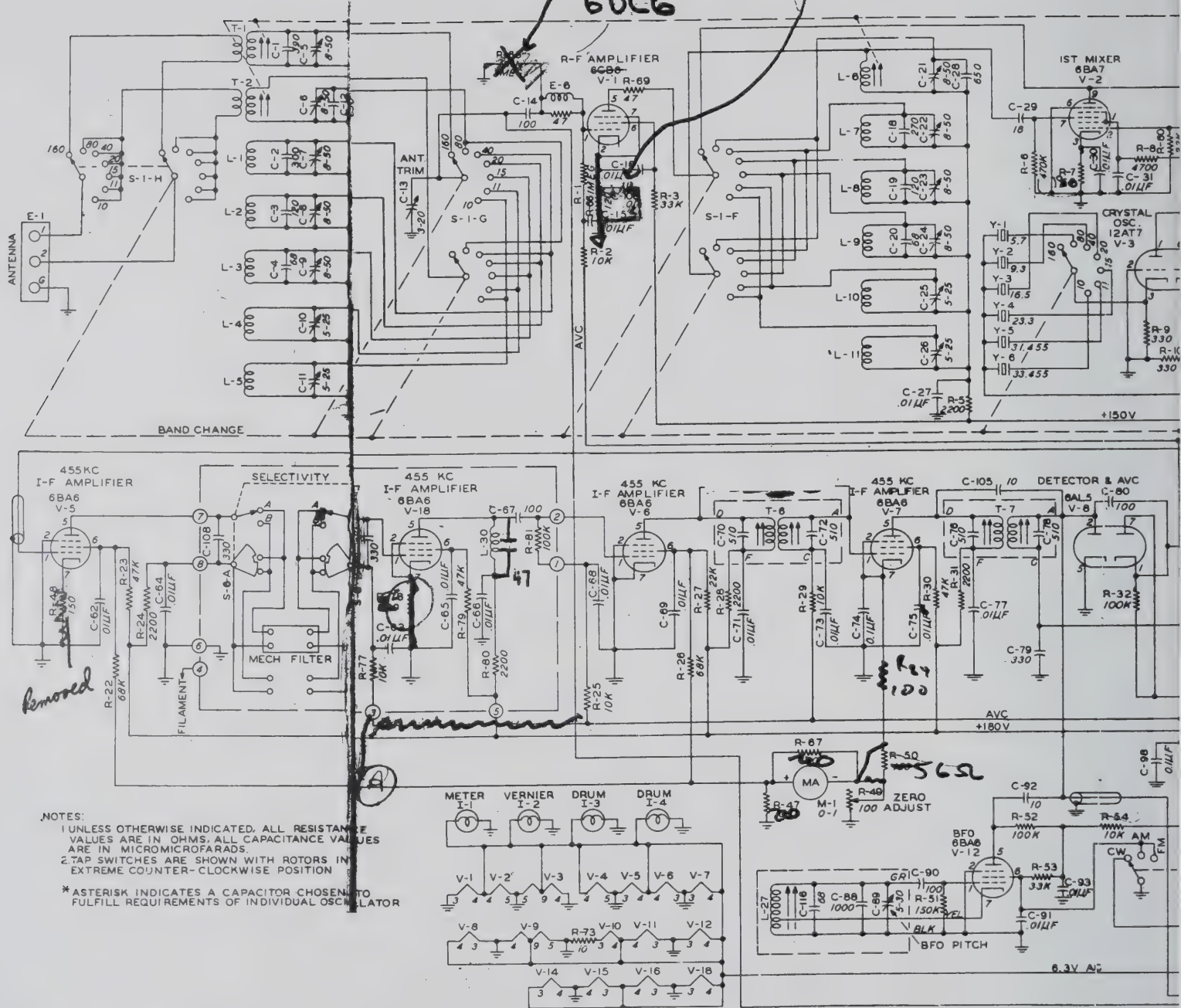
NOTE:
FOR CIRCUIT DETAILS, REFER TO
MAIN SCHEMATIC DIAGRAM, FIG.



*See mods.

Figure 5-6. 75A-3 Receiver, Schematic Diagram

FOR 60CG
 OMIT 1 megohm
 OMIT 120K
 60CG



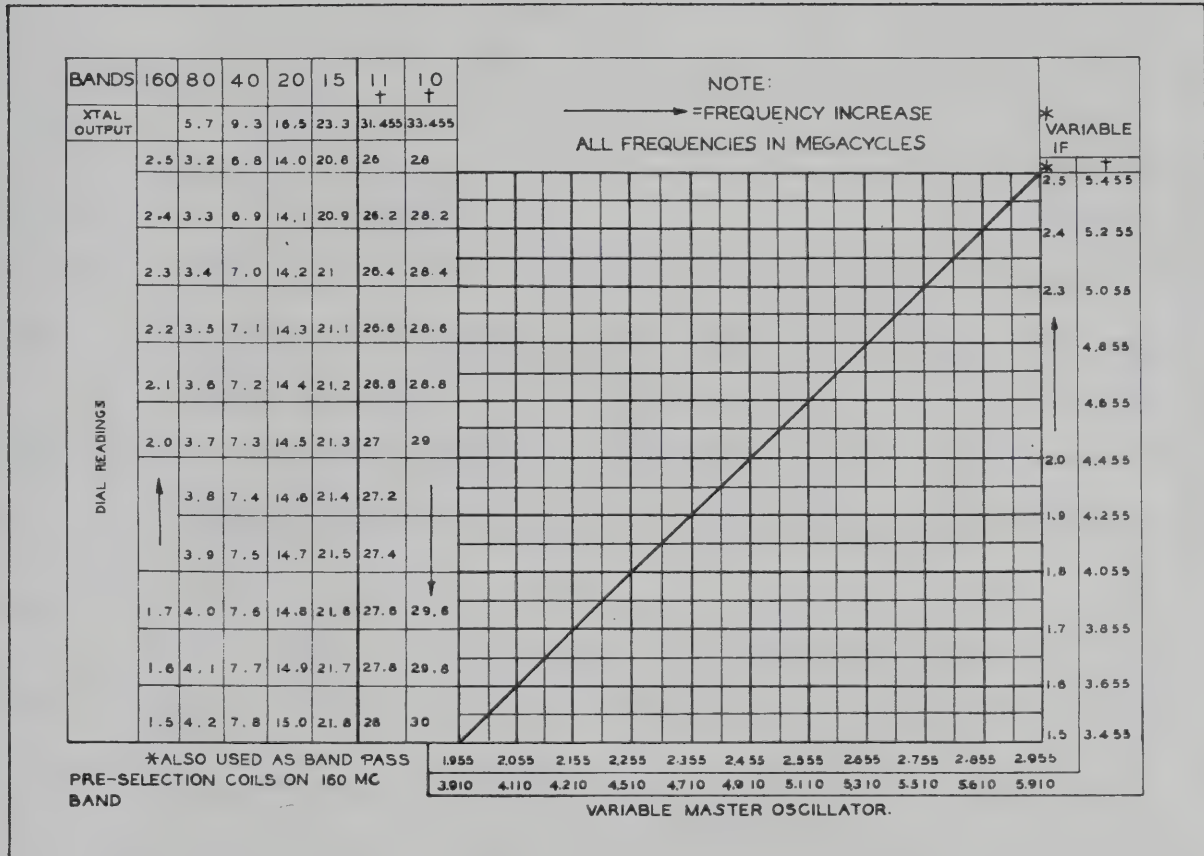


Figure 5-10. Dial Divisions Table

SECTION VI PARTS LIST

75A-3 RECEIVER

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-1	T-1 padding	CAPACITOR: mica; 390 mmf $\pm 2\%$, 500 WV	912 0535 00
C-2	L-1 padding	CAPACITOR: mica; 300 mmf $\pm 5\%$, 500 WV	912 0527 00
C-3	L-2 padding	CAPACITOR: mica; 120 mmf $\pm 10\%$, 500 WV	912 0501 00
C-4	L-3 padding	CAPACITOR: mica; 68 mmf $\pm 10\%$, 500 WV	912 0483 00
C-5	T-1 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-6	T-2 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-7	L-1 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-8	L-2 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-9	L-3 trimming	CAPACITOR, variable: ceramic 8-50 mmf, 350 WV	917 1038 00
C-10	L-4 trimming	CAPACITOR, variable: ceramic 5-25 mmf, 350 WV	917 1036 00
C-11	L-5 trimming	CAPACITOR, variable: ceramic 5-25 mmf, 350 WV	917 1036 00
C-12	T-2 padding	CAPACITOR: mica; 650 mmf $\pm 2\%$, 500 WV	912 0548 00
C-13	Antenna trimmer	CAPACITOR, variable: air; 2.6 - 19.7 mmf	922 0033 00
C-14	V-1 grid blocking	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-15	V-1 grid decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-16	V-1 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-17		Not used	

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-18	L-7 padding	CAPACITOR: mica; 270 mmf $\pm 5\%$, 500 WV	912 0524 00
C-19	L-8 padding	CAPACITOR: mica; 120 mmf $\pm 10\%$, 500 WV	912 0501 00
C-20	L-9 padding	CAPACITOR: mica; 68 mmf $\pm 10\%$, 500 WV	912 0483 00
C-21	L-6 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-22	L-7 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-23	L-8 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-24	L-9 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-25	L-10 trimming	CAPACITOR, variable: ceramic; 5-25 mmf, 350 WV	917 1036 00
C-26	L-11 trimming	CAPACITOR, variable: ceramic; 5-25 mmf, 350 WV	917 1036 00
C-27	V-1 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-28	L-6 padding	CAPACITOR: mica; 650 mmf $\pm 2\%$, 500 WV	912 0548 00
C-29	V-2 grid blocking	CAPACITOR: mica; 18 mmf $\pm 5\%$, 500 WV	912 0440 00
C-30	V-2 cathode by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-31	V-2 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-32	Band pass top coupling	CAPACITOR: ceramic; 5.0 mmf $\pm 1/4$ mmf, 500 WV	916 4384 00
C-33	V-2 injection coupling	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-34	V-3 plate to grid coupling	CAPACITOR: mica; 200 mmf $\pm 10\%$, 500 WV	912 0519 00
C-35	L-18 padding	CAPACITOR: mica; 56 mmf $\pm 10\%$, 500 WV	912 0477 00
C-36	V-3 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-37	L-12 padding	CAPACITOR: mica; 220 mmf $\pm 10\%$, 500 WV	912 0519 00
C-38	L-13 padding	CAPACITOR: mica; 120 mmf $\pm 10\%$, 500 WV	912 0501 00
C-39	L-14 padding	CAPACITOR: mica; 120 mmf $\pm 10\%$, 500 WV	912 0501 00
C-40	L-15 padding	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-41	L-16 padding	CAPACITOR: mica; 47 mmf $\pm 10\%$, 500 WV	912 0471 00
C-42	L-17 padding	CAPACITOR: mica; 39 mmf $\pm 10\%$, 500 WV	912 0465 00

Section VI
Parts List

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-43	L-19 trimming	CAPACITOR, variable: 8-50 mmf, 350 WV	917 1038 00
C-44	L-18 padding	CAPACITOR: mica; 330 mmf $\pm 5\%$, 500 WV	912 0530 00
C-45	V-2 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-46	L-18 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-47	First mixer blocking	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0556 00
C-48	Variable i-f coupling	CAPACITOR: ceramic; 4.0 mmf $\pm 1/2$ mmf, 500 WV	916 4381 00
C-49	Variable i-f coupling	CAPACITOR: ceramic; 1.0 mmf $\pm 1/4$ mmf, 500 WV	916 4368 00
C-50	L-22 padding	CAPACITOR: mica; 56 mmf $\pm 10\%$, 500 WV	912 0477 00
C-51	L-23 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-52	L-22 padding	CAPACITOR: mica; 330 mmf $\pm 5\%$, 500 WV	912 0530 00
C-53	L-22 trimming	CAPACITOR, variable: ceramic; 8-50 mmf, 350 WV	917 1038 00
C-54	V-4 cathode by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-55	V-4 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-56	T-3 padding	CAPACITOR: 510 mmf, part of T-3	
C-57	V-4 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-58	Crystal filter phasing	CAPACITOR, variable: air; 3.5 - 27 mmf	922 0079 00
C-59	Filter crystal shunt	CAPACITOR: mica; 10 mmf $\pm 10\%$, 500 WV	912 0432 00
C-60	L-24 padding	CAPACITOR: 100 mmf, part of L-24	
C-61	V-5 grid decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-62	V-5 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-63	V-18 grid return by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-64	V-5 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-65	V-18 screen grid by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-66	V-18 plate circuit by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-67	Coupling capacitor	CAPACITOR: mica; 100 mmf, 500 WV	912 0494 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-68	V-6 grid decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-69	V-6 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-70	T-6 primary padding	CAPACITOR: 510 mmf, part of T-6	
C-71	V-6 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-72	T-6 secondary padding	CAPACITOR: 510 mmf, part of T-6	
C-73	V-7 grid decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-74	V-7 cathode by-pass	CAPACITOR: paper; .1 mf $\pm 20\%$, 150 WV	931 0239 00
C-75	V-7 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-76	T-7 primary padding	CAPACITOR: 510 mmf, part of T-7	
C-77	V-7 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-78	T-7 secondary padding	CAPACITOR: 510 mmf, part of T-7	
C-79	Detector r-f filter	CAPACITOR: mica; 330 mmf $\pm 5\%$, 500 WV	912 0530 00
C-80	AVC coupling	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-81	AVC filter	CAPACITOR: paper; .1 mf $\pm 10\%$, 150-200 WV	931 0333 00
C-82	AVC amplifier	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-83	V-9 cathode coupling	CAPACITOR: electrolytic; 5 mf $+100\%$ -15%, 150 WV	183 1039 00
C-84	Noise limiter filter	CAPACITOR: paper; .1 mf $\pm 10\%$, 150-200 WV	931 0333 00
C-85	V-9 audio input coupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-86	V-11 audio input coupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-87	CW noise limiter audio input coupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-88	BFO (L-27) padding	CAPACITOR: 1000 mmf, part of L-27	
C-89	BFO (L-27) pitch adjust	CAPACITOR: 5-30 mmf, part of L-27	
C-90	BFO (V-12) grid blocking	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-91	V-12 screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-92	V-12 output coupling	CAPACITOR: mica; 10 mmf $\pm 10\%$, 500 WV	912 0432 00
C-93	V-12 screen decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-94	Back bias filter	CAPACITOR: electrolytic; 50 mf -10% +100%, 150 WV	183 1045 00
C-95	C-95A and C-95B	CAPACITOR: electrolytic; dual sect, 40 mf -15% +100% ea sect, 450 WV	183 1009 00
C-95A	Power supply filter	CAPACITOR: 40 mf; part of C-95	
C-95B	Power supply filter	CAPACITOR: 40 mf; part of C-95	
C-96	Back bias by-pass	CAPACITOR: paper; .1 mf $\pm 20\%$, 150 WV	931 0239 00
C-97	V-9 cathode by-pass	CAPACITOR: electrolytic; 20 mf -10% +100%, 150 WV	183 1042 00
C-98	AVC time constant	CAPACITOR: paper; .1 mf $\pm 10\%$, 150-200 WV	931 0333 00
C-99	V-11 plate stabilizing	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-100	VFO plate line by-pass	CAPACITOR: paper; .1 mf $\pm 20\%$, 150 WV	931 0239 00
C-101	V-4 screen and plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-102	B+ decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-103	B+ by-pass	CAPACITOR: paper; .5 mf +20% -10%, 600 WV	931 0205 00
C-104	Tweet trap series	CAPACITOR: mica; 270 mmf $\pm 5\%$, 500 WV	912 0524 00
C-105	T-7 top coupling	CAPACITOR: mica; 10 mmf $\pm 10\%$, 500 WV	912 0432 00
C-106	V-1 cathode by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-107	AC line filter	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-108	Mechanical filter input	CAPACITOR: mica; 330 mmf $\pm 5\%$, 500 WV	912 0530 00
C-109	Mechanical filter output	CAPACITOR: mica; 330 mmf $\pm 5\%$, 500 WV	912 0530 00
C-110	T-6 coupling	CAPACITOR: mica; 10 mmf $\pm 10\%$, 500 WV	912 0432 00
C-111	V-11 grid filter	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-114	V-9 grid filter	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-115	Decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-116	BFO (L-27) padding	CAPACITOR: 68 mmf (part of L-27)	
E-1	Antenna connector	STRIP: terminal; 3 screw term on bakelite board	306 0033 00
E-3	Speaker connector	STRIP: terminal; 4 screw term on bakelite board	306 0034 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
E-4	Meeting-stand by connector	STRIP: terminal; 4 screw term on bakelite board	306 0034 00
E-6		PARASITIC SUPPRESSOR: 47 ohm; #24 bus wire	504 7064 001
F-1	Line fuse	FUSE: cartridge; 2 amp, 250 V	264 4070 00
I-1	Meter illuminating	LAMP: Part of M-1	
I-2	Vernier dial	LAMP: pilot light bulb w/miniature bayonet base	262 3240 00
I-3	Megacycle dial	LAMP: pilot light bulb w/miniature bayonet base	262 3240 00
I-4	Megacycle dial	LAMP: pilot light bulb w/miniature bayonet base	262 3240 00
J-1	Phones jack	JACK: phone; 2 circuit, for 1/4" diam plug	360 0025 00
J-2		Not used	
J-3		Not used	
J-4	NBFM adaptor	SOCKET: octal	220 1013 00
J-5	Crystal calibrator adaptor	SOCKET: octal	220 1013 00
L-1	40 meter r-f inductance	COIL, RF: single wnd, single layer wnd, 18 turns #28 AWG DS wire	504 7000 001
L-2	20 meter r-f inductance	COIL, RF: single wnd, single layer wnd, 9 turns, #28 AWG DS wire	504 6999 001
L-3	15 meter r-f inductance	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001
L-4	11 meter r-f inductance	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6996 001
L-5	10 meter r-f inductance	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6996 001
L-6	80 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 16 turns #26 AWG E wire	504 7037 002
L-7	40 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 18 turns #28 AWG DS wire	504 7000 001
L-8	20 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 9 turns #28 AWG DS wire	504 6999 001
L-9	15 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
L-10	11 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6996 001
L-11	10 meter mixer inductance	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6996 001
L-12	80 meter crystal inductance	COIL, RF: 5.7 mc, single wnd, single layer wnd, 16 turns #28 AWG E wire	504 7004 001
L-13	40 meter crystal inductance	COIL, RF: single wnd, single layer wnd, 12 turns #28 AWG DS wire	504 6998 001
L-14	20 meter crystal inductance	COIL, RF: single wnd, single layer wnd, 7 turns #28 AWG DS wire	504 6997 001
L-15	15 meter crystal inductance	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-16	11 meter crystal inductance	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-17	10 meter crystal inductance	COIL, RF: 23, 31, 33 mc; single wnd, single layer wnd, 5 turns #28 AWG DS wire	504 7001 001
L-18	Low freq. variable i-f inductance	COIL, RF: 1.5 - 2.5 mc, single wnd, single layer wnd, 52 turns #32 AWG E wire	504 7005 001
L-19	High freq. variable i-f inductance	COIL, RF: single pie; duo lat wnd, 94 turns litz wire	504 7002 001
L-20		Not used	
L-21	Variable i-f trimmer inductance	COIL, RF: 5.7 mc, single wnd, single layer wnd, 16 turns #28 AWG E wire	505 1738 001
L-22	Low freq. variable i-f inductance	COIL, RF: 1.5 - 2.5 mc, single wnd, single layer wnd, 52 turns #32 AWG E wire	504 7005 001
L-23	High freq. variable i-f inductance	COIL, RF: single pie, duo lat wnd, 94 turns litz wire	504 7002 001
L-24	455 KC i-f input	COIL, RF: crystal filter grid; freq. range 440-470 kc (incl. C-60)	278 0085 00
L-27	BFO inductance	COIL, RF: BFO; freq. range 440-470 kc (incl. C-88, C-89)	278 0082 00
L-28	Power supply filter	REACTOR: filter; 5.0 hy at 0.080 amp	668 0019 00
L-29	Power supply filter	REACTOR: filter; 3.0 hy at 0.120 amp	668 0020 00
L-30	V-18 plate circuit	COIL, RF: 6 mh	506 1418 002
M-1	"S" meter	METER: signal level; 1 ma DC, 50 ohm $\pm 20\%$, DC resistance, illuminated dial (incl. I-1)	458 0044 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
P-1		CONNECTOR: not used	
P-2	A-C power cord and plug	CONNECTOR: two conductor flexible AC cord; std AC plug	426 1003 00
R-1	V-1 grid	RESISTOR: 1.0 megohm $\pm 10\%$, 1/2 w	745 1212 00
R-2	V-1 grid decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
R-3	V-1 screen	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1149 00
R-4	V-3 stabilizing	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1030 00
R-5	V-1 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-6	V-2 grid	RESISTOR: .47 megohm $\pm 10\%$, 1/2 w	745 1198 00
R-7	V-2 cathode	RESISTOR: 68 ohm $\pm 10\%$, 1/2 w	745 1037 00
R-8	V-2 screen	RESISTOR: 4700 ohm $\pm 10\%$, 2 w	745 9125 00
R-9	V-3 cathode	RESISTOR: 330 ohm $\pm 10\%$, 1/2 w	745 1065 00
R-10	V-3 cathode	RESISTOR: 330 ohm $\pm 10\%$, 1/2 w	745 1065 00
R-11	V-3 grid	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
R-12	V-3 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-13	V-2 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-14	V-4 grid	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-15	V-4 cathode	RESISTOR: 68 ohm $\pm 10\%$, 1/2 w	745 1037 00
R-16	V-4 screen dropping	RESISTOR: 8200 ohm $\pm 10\%$, 2 w	745 9136 00
R-17	V-4 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-18	Sensitivity control	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1149 00
R-19	Sensitivity	RESISTOR: 5600 ohm $\pm 10\%$, 1/2 w	745 1118 00
R-20	Sensitivity	RESISTOR: 1500 ohm $\pm 10\%$, 1/2 w	745 1093 00
R-21	V-5 grid decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
R-22	V-5 screen voltage divider	RESISTOR: 68,000 ohm $\pm 10\%$, 1/2 w	745 1163 00
R-23	V-5 screen dropping	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1156 00
R-24	V-5 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-25	V-6 grid decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-26	V-6 screen voltage divider	RESISTOR: 68,000 ohm $\pm 10\%$, 1/2 w	745 1163 00
R-27	V-6 screen dropping	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1142 00
R-28	V-6 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-29	V-7 grid decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
R-30	V-7 screen dropping	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1156 00
R-31	V-7 plate decoupling	RESISTOR: 2200 ohm $\pm 10\%$, 1/2 w	745 1100 00
R-32	AVC rectifier load	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-33	AVC amplr. input filter	RESISTOR: .47 megohm $\pm 10\%$, 1/2 w	745 1198 00
R-34	AVC amplr. input filter	RESISTOR: 0.12 megohm $\pm 10\%$, 1/2 w	745 1174 00
R-35	AVC amplr. stabilizing	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-36	Back bias	RESISTOR: 100 ohm $\pm 10\%$, 2 w	745 5044 00
R-37	Back bias	RESISTOR: wire wound; 350 ohm $\pm 10\%$, 10 w	710 1350 20
R-38	Back bias	RESISTOR: 120 ohm $\pm 10\%$, 2 w	745 5048 00
R-39	Noise limiter	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1156 00
R-40	Noise limiter	RESISTOR: 47,000 ohm $\pm 10\%$, 1/2 w	745 1156 00
R-41	Noise limiter cathode	RESISTOR: .47 megohm $\pm 10\%$, 1/2 w	745 1198 00
R-42	Noise limiter	RESISTOR: .47 megohm $\pm 10\%$, 1/2 w	745 1198 00
R-43	V-9 cathode	RESISTOR: 6800 ohm $\pm 10\%$, 1/2 w	745 1121 00
R-44	Audio gain control	RESISTOR, variable: 500,000 ohm $\pm 20\%$, 1/4 w	376 4499 00
R-45	V-9 plate	RESISTOR: .22 megohm $\pm 10\%$, 1/2 w	745 1184 00
R-46	V-11 grid	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-47	S meter bridge	RESISTOR: 100 ohm $\pm 10\%$, 1/2 w	745 1044 00
R-48	Cathode of V-5	RESISTOR: 150 ohm $\pm 10\%$, 1/2 w	745 1051 00
R-49	S meter zero adjust	RESISTOR, variable: 100 ohm $\pm 10\%$, 1 w	377 0122 00
R-50	V-7 cathode	RESISTOR: 150 ohm $\pm 10\%$, 1/2 w	745 1051 00
R-51	V-12 grid	RESISTOR: .15 megohm $\pm 10\%$, 1/2 w	745 1177 00
R-52	V-12 plate dropping	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-53	V-12 screen dropping	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1149 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-54	V-12 plate decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
R-55	AVC filter	RESISTOR: 220,000 ohm $\pm 10\%$, 1/2 w	745 1184 00
R-56	AVC amplr. plate dropping	RESISTOR: 15,000 ohm $\pm 5\%$, 1/2 w	745 1134 00
R-57	RF gain control	RESISTOR, variable: 10,000 ohm $\pm 10\%$, 1/2 w	376 3522 00
R-58	RF gain series	RESISTOR: 560 ohm $\pm 5\%$, 1/2 w	745 1075 00
R-59	Audio load	RESISTOR: 10 ohm $\pm 10\%$, 2 w	745 5002 00
R-60	V-2 injection grid	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1142 00
R-61	V-9 cathode	RESISTOR: 1500 ohm $\pm 10\%$, 1/2 w	745 1093 00
R-62	CW limiter control	RESISTOR, variable: 10,000 ohm, $\pm 20\%$, 1/2 w	376 4022 00
R-63	CW limiter voltage divider	RESISTOR: 68,000 ohm $\pm 10\%$, 1 w	745 3163 00
R-64	B+ isolation	RESISTOR: 1000 ohm $\pm 10\%$, 1 w	745 3086 00
R-65	V-1 grid voltage divider	RESISTOR: 1 megohm $\pm 10\%$, 1/2 w	745 1212 00
R-66	V-1 cathode	RESISTOR: 120 ohm $\pm 10\%$, 1/2 w	745 1048 00
R-67	M-1 shunt	RESISTOR: 100 ohm $\pm 10\%$, 1/2 w	745 1044 00
R-68	T-3 primary load	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-69	V-1 stabilizer	RESISTOR: 47 ohm $\pm 10\%$, 1/2 w	745 1030 00
R-70	Regulator dropping	RESISTOR: 2500 ohm $\pm 10\%$, 10 w size	710 0030 00
R-71	Bias adjust	RESISTOR: 3900 ohm p/m 10%, 1 w	745 3111 00
R-72	Bias adjust	RESISTOR: 3900 ohm p/m 10%, 1 w	745 3111 00
R-73	Filament dropping for V-10	RESISTOR: 10 ohm p/m 10%, 1 w	745 3002 00
R-74	V-11 grid decoupling	RESISTOR: 10 ohm p/m 10%, 1/2 w	745 1170 00
R-75		Not used	
R-76	Back bias	RESISTOR: 1500 ohm p/m 10%, 10 w	710 0027 00
R-77	Grid decoupling	RESISTOR: 10,000 ohm p/m 10%, 1/2 w	745 1128 00
R-78	V-18 cathode	RESISTOR: 680 ohm p/m 5%, 1/2 w	745 1078 00
R-79	Screen grid dropping	RESISTOR: 47,000 ohm p/m 10%, 1/2 w	745 1156 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R-80	Plate decoupling	RESISTOR: 2200 ohm p/m 10%, 1/2 w	745 1100 00
R-81	V-6 grid	RESISTOR: 100,000 ohm p/m 10%, 1/2 w	745 1170 00
S-1	S-1A, B, C, D, E, F, G, and H	SWITCH, rotary: consists of:	
S-1A	Variable i-f selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1294 00
S-1B	Variable i-f selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1294 00
S-1C	Variable i-f selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1294 00
S-1D	Crystal coil selecting	SWITCH, rotary: 1 circuit, 6 position, shorting	269 1293 00
S-1E	Crystal selector	SWITCH, rotary: 1 circuit, 6 position, shorting	269 1293 00
S-1F	Mixer grid coil selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1296 00
S-1G	RF amplr. grid coil selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1296 00
S-1H	Antenna coil selecting	SWITCH, rotary: 1 circuit, 7 position, shorting	269 1295 00
S-2	SELECTIVITY selector	SWITCH, rotary: band change; 1 circuit, 5 position, shorting	259 0415 00
S-3	CW-AM-FM selecting	SWITCH, rotary: 1 circuit, 3 position, shorting	259 0416 00
S-4	LIMITER	SWITCH, rotary: 2 circuit, 3 position, non-shorting	259 0417 00
S-5	OFF-STANDBY-ON	SWITCH, rotary: band change; 2 circuit, 3 position, shorting	259 0363 00
S-6A, S-6B	Selects mechanical filter	SWITCH SECTION, rotary: 1 circuit, 12 position	269 1625 00
T-1	160 meter r-f coil assembly	COIL, RF: two wnd, single layer wnd, one wnd w/ 51 turns, other wnd w/4 turns	504 7038 002
T-2	80 meter r-f coil assembly	COIL, RF: two wnd, single layer wnd, one wnd w/16 turns, other wnd w/3 turns	504 7039 002
T-3	Second mixer plate coil assembly	TRANSFORMER: crystal filter plate; freq. range 440-470 kc (incl. C-56)	278 0083 00
T-4		Not used	

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
T-5		Not used	
T-6	V-6, V-7 i-f coil assembly	TRANSFORMER: intermediate freq. 455; freq. range 440-470 kc (incl. C-70, C-72)	278 0084 00
T-7	V-7, V-8 i-f coil assembly	TRANSFORMER: intermediate freq. 455; freq. range 440-470 kc (incl. C-76, C-78)	278 0084 00
T-8	Audio output	TRANSFORMER: audio output; pri 5000 ohm secd 500 ohm tapped at 4 ohm, 2500 TV	667 0018 00
T-9	Power supply	TRANSFORMER, power: pri 117 v, secd #1; 700 v CT, secd #2: 5.0 v secd #3: 6.3 v 2500 TV, 50/60 cps	662 0017 00
V-1	RF amplr.	TUBE: type 6CB6; pentode 6DC6	255 0207 00
V-2	First mixer	TUBE: type 6BA7; pentagrid	255 0209 00
V-3	Crystal oscillator	TUBE: type 12AT7; double triode	255 0205 00
V-4	Second mixer	TUBE: type 6BA7; pentagrid 6UB	255 0209 00
V-5	IF amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-6	IF amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-7	IF amplifier	TUBE: type 6BA6; pentode	255 0185 00
V-8	Detector and AVC rectifier	TUBE: type 6AL5; double diode	257 0018 00
V-9	AVC and AF amplifier	TUBE: type 12AX7; double triode	255 0201 00
V-10	Automatic noise limiter	TUBE: type 6AL5; double diode	257 0018 00
V-11	Audio output	TUBE: type 6AQ5; beam pentode	255 0195 00
V-12	Beat frequency oscillator	TUBE: type 6BA6; pentode	255 0185 00
V-13	Power supply rectifier	TUBE: type 5Y3GT; full wave rectifier	255 0157 00
V-16	CW noise limiter	TUBE: type 6AL5; double diode	257 0018 00
V-17	Voltage Regulator	TUBE: type OA2	257 0252 00
V-18	IF amplifier	TUBE: type 6BA6; pentode	255 0185 00
XF-1	Fuse holder	FUSE HOLDER: extractor post for 3 AG fuse	265 1002 00
XI-2	Socket for I-2	LAMPHOLDER: for use w/ T-3-1/4 miniature bayonet base bulb	262 0150 00
XI-3, XI-4	Socket for I-3 and I-4	LAMPHOLDER: bracket for miniature bayonet base bulb	262 1210 00

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ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
XV-1	Socket for V-1	SOCKET, tube: 7 contact miniature	220 1034 00
XV-2	Socket for V-2	SOCKET, tube: 9 contact miniature	220 1062 00
XV-3	Socket for V-3	SOCKET, tube: 9 contact miniature	220 1062 00
XV-4	Socket for V-4	SOCKET, tube: 9 contact miniature	220 1062 00
XV-5, XV-6, XV-7, XV-8	Socket for V-5, V-6, V-7, V-8	SOCKET, tube: 7 contact miniature	220 1034 00
XV-9	Socket for V-9	SOCKET, tube: 9 contact miniature	220 1053 00
XV-10, XV-11, XV-12	Socket for V-10, V-11, V-12	SOCKET, tube: 7 contact miniature	220 1046 00
XV-13	Socket for V-13	SOCKET, tube: octal	220 1013 00
XV-16, XV-17, XV-18	Socket for V-16, V-17, V-18	SOCKET, tube: 7 contact miniature	220 1046 00
XY-1, XY-2, XY-3, XY-4, XY-5, XY-6	Socket for Y-1, Y-2, Y-3, Y-4, Y-5, Y-6	SOCKET, crystal: 6 crystal holders on phenolic board	504 7063 002
Y-1	80 meter band crystal	CRYSTAL: 5.7 mc	291 8070 00
Y-2	40 meter band crystal	CRYSTAL: 9.3 mc	291 8071 00
Y-3	20 meter band crystal	CRYSTAL: 16.5 mc	291 8072 00
Y-4	15 meter band crystal	CRYSTAL: 23.3 mc	291 8073 00
Y-5	11 meter band crystal	CRYSTAL: 31.455 mc	291 8074 00
Y-6	10 meter band crystal	CRYSTAL: 33.455 mc	291 8075 00
Y-7	455 kc filter crystal	CRYSTAL: 455 kc	291 5957 00
70E-12	OSCILLATOR (VFO)	This unit has been dehydrated and hermetically sealed, and should be returned to the Collins Radio Company if servicing is required.	
F455 B3	MECHANICAL FILTER	This unit has been dehydrated and hermetically sealed, and should be returned to the Collins Radio Company if servicing is required.	

148C-1 NBFM Adaptor

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-201	Input coupling	CAPACITOR: mica; 10 mmf $\pm 10\%$, 500 WV	912 0432 00
C-202	Screen by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-203	V-201 plate decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-204	T-201 secondary tuning	CAPACITOR: 1000 mmf, part of T-201	
C-205	T-201 secondary tuning	CAPACITOR: 1000 mmf, part of T-201	
C-206	Output r-f filter	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-207	Output r-f filter	CAPACITOR: mica; 100 mmf $\pm 10\%$, 500 WV	912 0495 00
C-208	De-emphasis	CAPACITOR: mica; 220 mmf $\pm 10\%$, 500 WV	912 0519 00
C-209		CAPACITOR: 510 mmf, part of T-201	
P-203	Power connector	CONNECTOR, receptacle: 8 male contacts	369 1013 00
R-201	V-201 grid	RESISTOR: 1.0 megohm $\pm 10\%$, 1/2 w	745 1212 00
R-202	V-201 screen bleeder	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1149 00
R-203	V-201 screen dropping	RESISTOR: 33,000 ohm $\pm 10\%$, 1/2 w	745 1149 00
R-204	V-201 plate decoupling	RESISTOR: 1000 ohm $\pm 10\%$, 1/2 w	745 1086 00
R-205	V-202 plate decoupling	RESISTOR: 22,000 ohm $\pm 10\%$, 1/2 w	745 1142 00
R-206	Diode load	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-207	Diode load	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-208	De-emphasis	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
T-201	Discriminator	TRANSFORMER: narrow band discriminator; 455 kc center frequency	278 0089 00
V-201	Limiter	TUBE: type 6AU6; pentode	255 0202 00
V-202	Discriminator	TUBE: type 6AL5; twin diode rectifier	257 0018 00
XV-201, XV-202	Socket for V-201, V-202	SOCKET, tube: 7 pin miniature	220 1046 00
8R-1 Crystal Calibrator			
C-301	Calibration oscillator zero adj	CAPACITOR, variable; ceramic; 5-25 mmf, 350 WV	917 1036 00
C-302	Cathode by-pass	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
C-303	Screen by-pass	CAPACITOR: mica; 220 mmf $\pm 10\%$, 500 WV	912 0519 00

Section VI
Parts List

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C-304	Screen decoupling	CAPACITOR: ceramic; 10,000 mmf, 350 WV	913 0566 00
P-304	Power connector	CONNECTOR, receptacle: 8 male contacts	369 1013 00
R-301	Grid	RESISTOR: 0.68 meg $\pm 10\%$, 1/2 w	745 1205 00
R-302	Cathode	RESISTOR: 4700 ohm $\pm 10\%$, 1/2 w	745 1114 00
R-303	Screen dropping	RESISTOR: .10 megohm $\pm 10\%$, 1/2 w	745 1170 00
R-304	Screen voltage divider	RESISTOR: .22 megohm $\pm 10\%$, 1/2 w	745 1184 00
R-305	Decoupling	RESISTOR: 10,000 ohm $\pm 10\%$, 1/2 w	745 1128 00
V-301	Oscillator	TUBE: type 6BA6; pentode	255 0185 00
XV-301	Socket for V-301	SOCKET, tube: 7 pin miniature	220 1046 00
XV-301	Socket for crystal	SOCKET, crystal: steatite	292 0055 00
Y-301	100 kc calibrator	CRYSTAL: special; 100 kc	291 5954 00
270 G-2	Speaker		
LS	Loud speaker	SPEAKER: permanent magnet; 6-8 voice coil impedance, 8 w	271 0076 00

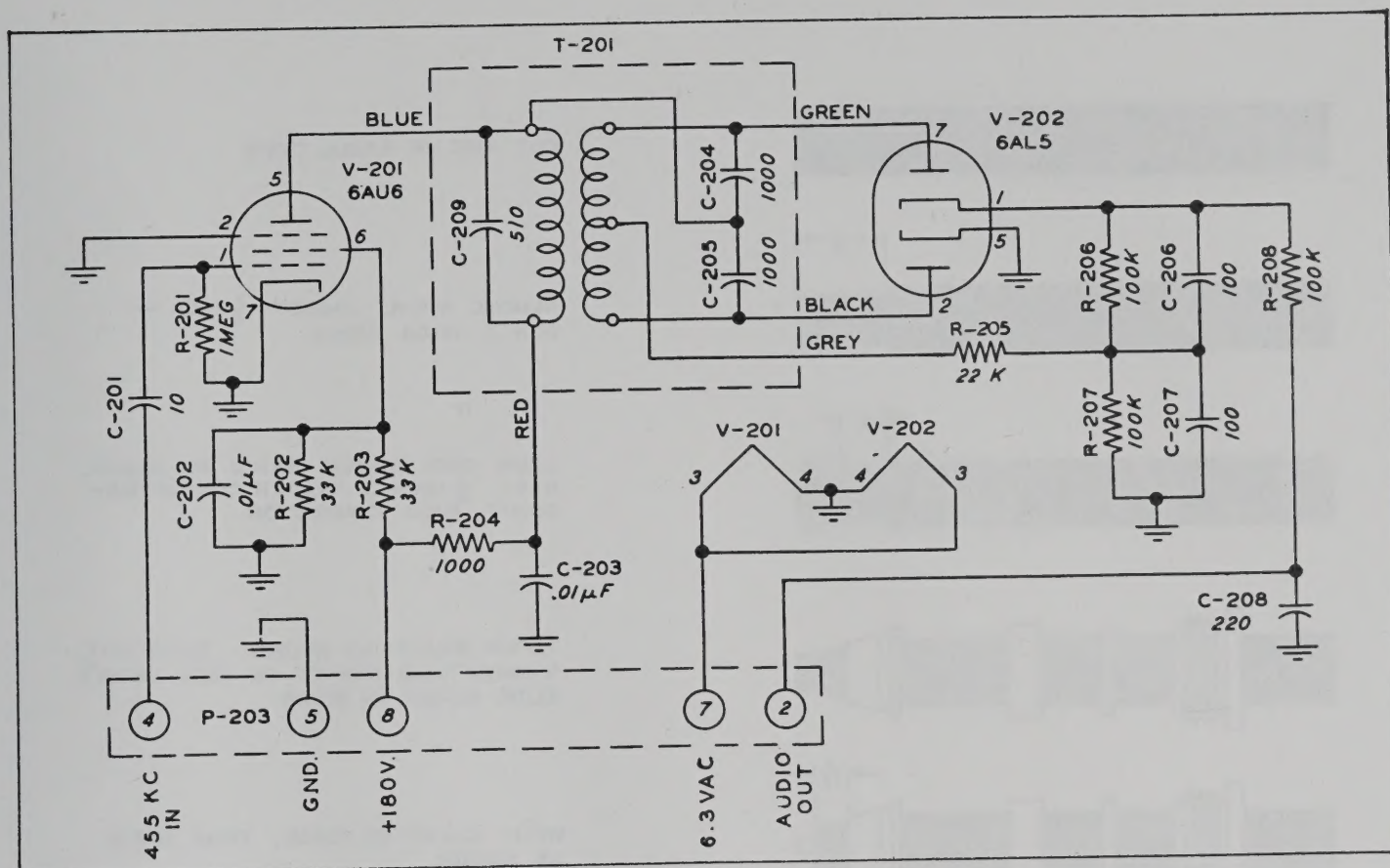


Figure 5-7. 148C-1 NBFM Adaptor Schematic Diagram

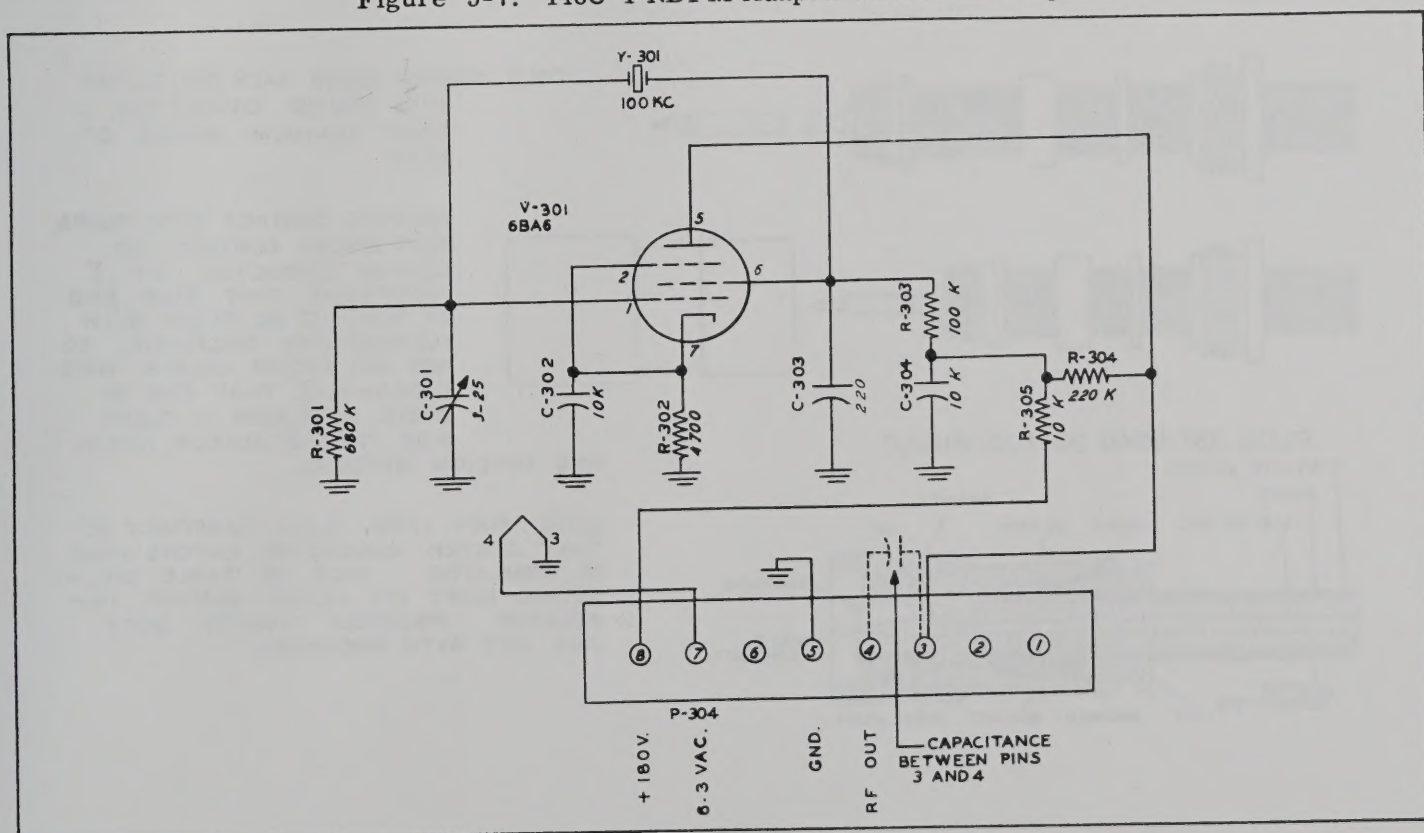


Figure 5-8. 8R-1 Crystal Calibrator, Schematic Diagram



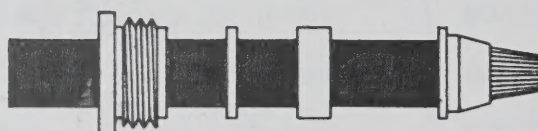
CUT END OF CABLE EVEN.



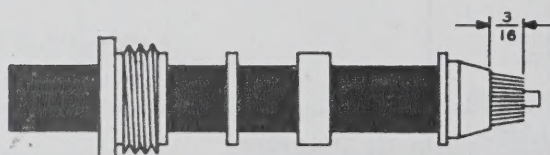
REMOVE VINYL JACKET $\frac{1}{2}$ INCH —
DON'T NICK BRAID.



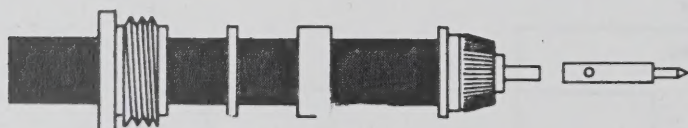
COMB OUT COPPER BRAID AS SHOWN.
BARE $\frac{1}{4}$ INCH OF CENTER CONDUCTOR—
DON'T NICK CONDUCTOR.



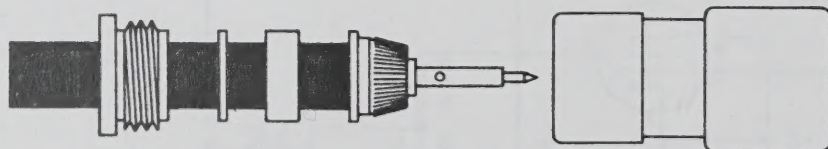
TAPER BRAID AS SHOWN. SLIDE NUT,
WASHER AND GASKET ON VINYL JACKET.
SLIDE CLAMP ON BRAID.



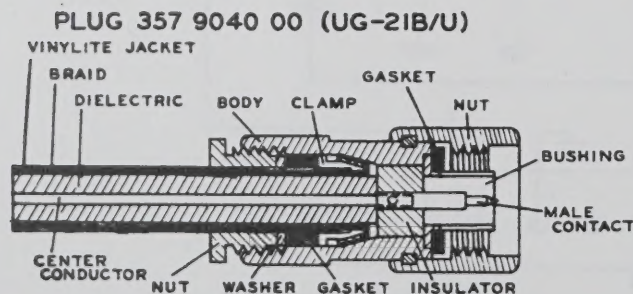
WITH CLAMP IN PLACE, TRIM BRAID
AS SHOWN.



FOLD COPPER BRAID BACK ON CLAMP.
TIN CENTER CONDUCTOR,
USING MINIMUM AMOUNT OF
HEAT.



HOLDING CONTACT WITH PLIERS,
SOFT SOLDER CONTACT TO
CENTER CONDUCTOR. IT IS
IMPERATIVE THAT BACK END
OF CONTACT BE FLUSH WITH
POLYETHYLENE DIELECTRIC. DO
NOT USE EXCESS SOLDER. WIPE
CLEAN—SEE THAT END OF
CABLE INSULATOR IS CLEAN
AND FREE OF SOLDER, ROSIN
AND FOREIGN MATERIAL.



SLIDE BODY INTO PLACE CAREFULLY SO
THAT CENTER CONDUCTOR ENTERS HOLE
IN INSULATOR. FACE OF CABLE DIE-
LECTRIC MUST FIT FLUSH AGAINST IN-
SULATOR. PROPERLY TIGHTEN BODY
AND NUT WITH WRENCHES.

Figure 5-9. Assembling Plug UG-21B/U to Cable RG-8/U

COLLINS RADIO COMPANY

MAIN PLANT:

855 35TH ST. N.E., CEDAR RAPIDS, IOWA

BRANCHES:

1930 HI-LINE DRIVE, DALLAS 2, TEXAS

11 WEST 42ND STREET, NEW YORK 36, N. Y.

2700 WEST OLIVE AVE., BURBANK, CALIF.

